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MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120

June 1997

PAINT WW I LOZENGE PATTERNS

56 Planes you can fly anywhere...

HAND-LAUNCH GLIDER GUIDE

—page 24



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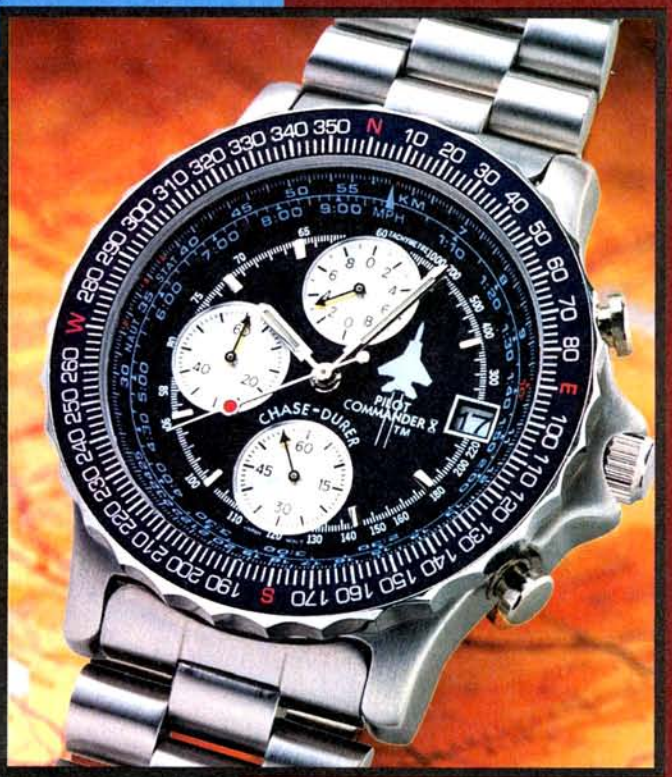
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ON THIS PAGE: *top—Guy Fawcett shares his techniques for creating WW I lozenge camouflage. Center—this 140-pound F-18E model is helping the Navy to develop its next advanced fighter (see "Final Approach"). Bottom—Philip Kent's Mohawk Pinto is an IMAA-legal Golden Age monoplane.*

ON THE COVER: *main photo—the Great Planes Extra 300S puts on a show (photo by Walter Sidas). Inset left: Hobby Lobby's Eco is setting a new standard for electric helicopters.*

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EDITORIAL

by LARRY MARSHALL

ARE YOU A LIFER?

A FEW years ago, there was a lot of discussion about whether model aviation was a sport or a hobby. Model aviation has persisted as a hobby for a lot of years, but some felt we could raise the profile of building and flying R/C airplanes by referring to it as a sport—I guess because sports are sometimes held to be so important to our culture.

These discussions, however, emphasized the flying aspects, as it is really the only part that could be construed as a sport. Ironically, these days, people concerned about model aviation talk about "flyers" and "modelers" and discuss how we might get people who simply "fly" to partake in other aspects of the ... hobby. All of this would be quite comical if not for the fact that concerns about furthering model aviation, helping people enjoy the hobby and discussing ways of accomplishing these things should be taken quite seriously.

With this as a backdrop, I've thought a lot about what causes our hobby to generate such a loyal following and also what might be the reasons for the high turnover we see (many newcomers drop out of our hobby within two or three years). I've come to the conclusion that the two phenomena are related and that possibly we can do something to grow our ranks by facilitating the movement of people from casual flyer into the category of "lifer," as Dave Thornburg once called people who have an undying passion for model aviation.

I think most folks get into model aviation these days because they have a desire to fly. Typically, they buy an ARF or maybe a simple kit. Building is seen as a means to an end, and the time and effort required is kept to a minimum. If these newcomers are fortunate, they have an instructor who will quickly have them flying solo. Training ends ... the fun begins. These flyers fly ... around and around. Some will learn sport aerobatics. Some will even become quite good at doing them. But, ultimately, where is the next challenge? Is this why they drop out of our hobby? No challenges?

People who become lifers, however, seem to fit a different profile.



See our hand-launch sailplane product guide on page 24.

Somewhere along the line, they found interests in competitive flying and/or activities peripheral to flying. Some find that regimented aerobatics flying is for them; others find their challenges in pylon racing.

But the vast majority of lifers stay interested in the hobby by being involved with hobby interests that are quite separate from actual flying. Some get excited about electronics and build all sorts of neat devices that give them pleasure. Some become interested in aerodynamics. Others find pleasure in understanding weather, thermals, and such. Many, including me, become interested in scale modeling, and this interest leads us to spend a great deal of our time thinking about and studying full-scale aircraft, hunting for documentation and planning our next project. One of the most enjoyable parts of this hobby for me is to spend time looking at plans while I marvel at the designers' abilities and learn from their techniques.

But all the lifers I've known have one thing in common: they enjoy building airplanes. Yes, we all build with the notion of flying our creations, but it's much more to us than a means to an end. It's a pleasurable experience. It's a focal point for our creativeness—a place to apply newly learned techniques. Heck, it's our way of unwinding at the end of a hard day at the office.

Many people say they have no time for building. These same people spend hours every week watching TV. Put the TV in your shop area and enjoy. The truth is, we are busier these days. But all that really means is that it will take a bit longer to get a plane built; it doesn't prevent anyone from enjoying the few hours a week they do get to spend in our shops.

So, there you have it. Lifers simply enjoy aspects of this hobby that flyers don't. In my view, we can prevent a lot of folks from leaving this hobby by helping them to discover the joys of other aspects of our hobby. There's no need for you to agree or disagree with the particulars, but I would encourage you to think about your hobby in terms of keeping—as well as obtaining—members. What can we here at *Model Airplane News* do to get people more deeply involved? What do you or your club do, once a new member solos, to help him progress in the hobby? Could we all do more?

HIGHLIGHTS

This month, we take an extensive look at hand-launch sailplanes as Dave Garwood presents data on 56 different sailplanes. For you scale WWI fanatics, Guy Fawcett makes it easy to apply lozenge camouflage, a typically arduous process. We're also fortunate to be able to present you with plans from Philip Kent; his IMAA-legal Mohawk Pinto is magnificent.



AirSCOOP

by CHRIS CHIANELLI

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

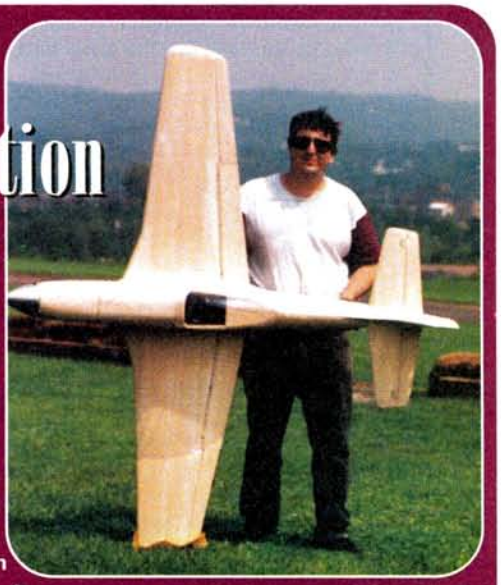
SYMTEC Variable Pitch Props

I know what some are going to ask about a variable-pitch prop: is it safe? All Symtec hubs are tested to three times past their rated limit. For example: a 20-inch Symtec assembly, whose normal rpm rating is 9,000, is stress-tested to 27,000rpm! Available in 18 to 32 inches, the Symtec hubs also come in 2-, 3- and 4-blade configurations. Blade-style options are: standard (square), swept-tip (racing) and classic shape (wider chord and rounded tip). The blades are density-matched for excellent balance and can be purchased one blade at a time with a specific density rating, so matching a replacement to a blade you already have presents no problem. Bushing, bolts and nuts are available to facilitate fitting to any engine. These hubs and props were born of the ultralight industry and come with extensive experience and testing backing them up. For more information, contact Gerard Enterprises, W226 N825 Eastmound Dr., Waukesha, WI 53186; (414) 521-0547; fax (414) 521-0551.



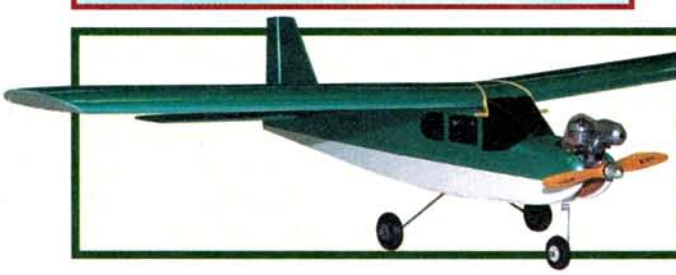


Coming construction article



A while back, I asked *Model Airplane News* veteran contributor Steve Scotto to design a Mustang to my specs. My specs are simple. Make it large enough to fly like a majestic dream and small enough to be powered by engines the advanced sport modeler is likely to have around his shop (a .90 2-stroke or 1.20 4-stroke, to be specific); keep the wing between 72 and 75 inches to fit in a passenger car; and please, Steve, simplify construction where possible. I've found that models really start to fly smoothly and scale-like just around the 6-foot mark. The difference in flight performance between a 62-inch-span model and a 72-inch-span model is like night and day. I know there are lots of guys out there who don't go to IMAA meets (just like me), but still love having a larger warbird to do some Sunday strafing runs with. Anyway, here's Steve's 74-inch P-51D ready for covering; he predicts it will be everything I ordered, plus he gave it an exact-scale outline! Test flights are just around the corner. Oh, yeah; Steve is drawing up a supplement sheet for a "B" version—my favorite. Thanks, Steve!

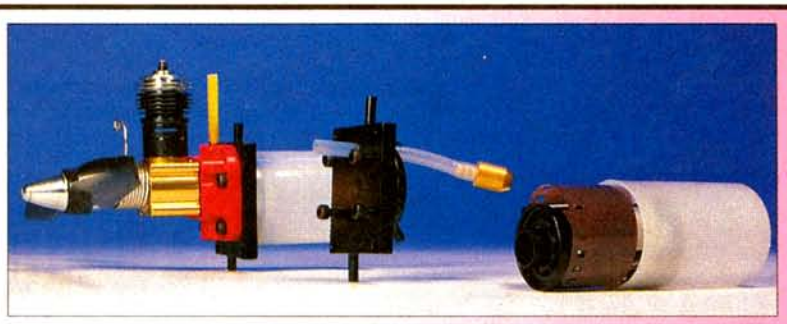




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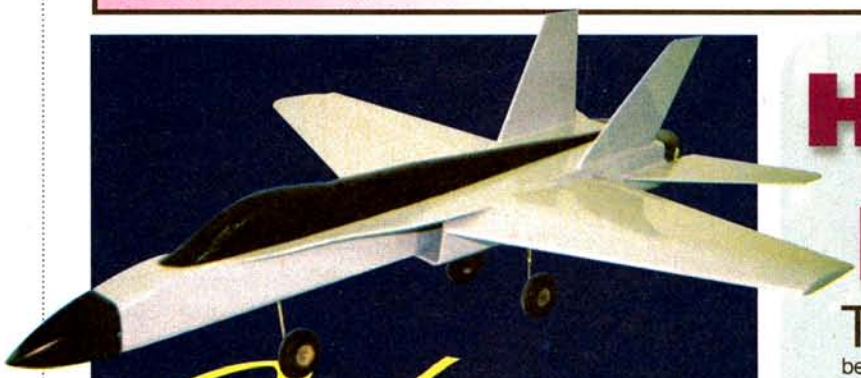
This Kadetito (*Model Airplane News* plans November '94) was built by 13-year-old Rachel Bell. With very little assistance, my friends, Rachel won first place in the Junior Division at the WRAM show in Westchester, NY. Nice job, Rachel. Congratulations.

Extend ½A Duration



This little tank/mount conversion for the Cox .049/.051 engines, which uses a 35mm film canister for the tank, was CAD designed, CNC machined out of billet stock, then anodized for corrosion protection. The vent and feed tubes are already installed, and the package comes complete with clunk, fuel tubing and mounting screws. Instructions for assembly and mounting are included. The manufacturer claims totally consistent fuel delivery for aerobatics and even inverted flight as long as the tank is at least half full. Duration is estimated at 20 minutes, depending on which engine is used. TD adapters are in the works. For more information, contact JK Aerotech, 5120 E. Powell, Gresham, OR 97080; (503) 665-3824.





Cobra Pusher

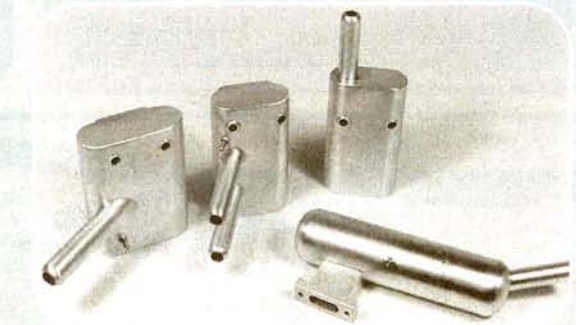
The YF-17, known to some as the Cobra, was the prototype for the F-18. Bob Dively's new model of the YF-17 is a sport/scale pusher designed for intermediate to advanced pilots. It features foam wing-cores, balsa-slab fuselage sides and simple sheet tail surfaces. Many parts are hand-cut and router-finished for quick and accurate construction. Kit includes full-size plans and instruction manual, all sheeting and hardware needed, plus vacuum-formed canopy, turtle deck, nose cone and tail cone. Designed for .40 to .46 2-stroke engines. Specs: wingspan—43 inches; length—50 inches; weight—5 to 6 pounds. The manufacturer claims the model can be built in a weekend. For more information, contact Bob Dively Models, 38131 Airport Pky. #206, Willoughby, OH 44094; (216) 953-9254; fax (216) 953-9311.

YF-17

HUNGARY FOR POWER!



The latest in the Hungarian Moki line of high-performance engines is this new 1.20. Reported to be very smooth for a single-cylinder, the 1.20 lives up to the performance reputation Moki has built for itself. Add to that Moki's unique fuel-metering carburetor for a reliable idle and dependable throttle transition, and you have one great sport/pattern engine. Also shown is the wide variety of Bisson mufflers available for the Moki 1.20 (upright, inverted, horizontal—whatever). Installation in any model, scale or otherwise, should present no problem. Other accessories include remote needle-valve, radial mount, spinner adapter nuts, FAI side-to-rear header pipes and much more. Contact Gerard Enterprises, W226 N825 Eastmound Dr., Waukesha, WI 53186; (414) 521-0547; fax (414) 521-0551.



ARGENTINE AIR FORCE



During my visit to Buenos Aires for the first Jets Over Argentina this past winter, I stumbled on a manufacturer with some interesting models. TNT models has been operated by Norberto Tenorio for 12 years, and I thought some of his creations in fiberglass, epoxy resins and Kevlar were not only interesting, but also worthy of consideration for import to the USA. Pictured here with the kits are Marcela Tenorio and Maria Julia Raffo, who exemplify the cheerful beauties of Argentina. Bottom: the women are with TNT's 78-inch-wingspan Sukhoi Su-26M. Like other TNT kits, the Su-26 features a fiberglass fuselage, sheeted-foam wing panels and many sawn parts. Above: Maria holds the TNT F-16 to show the wing and tail-group pieces as they come out of the box. Below: Marcela holds TNT's A-4 Skyhawk. This is my favorite because though it can be made with ducted-fan power, it can also utilize simple prop power that makes it a "fun-attack" sport plane. Mr. Tenorio participates in combat simulation demos complete with aerial-attack missiles using the A-4. Interested distributors should contact Sr. Tenorio Badaraco, 250 Ituzaingo (1714), Buenos Aires, Argentina; fax: 011-54-1-623-1146, 8:30 a.m. to 12:30 p.m., or 3:30 p.m. to 8 p.m. (Buenos Aires time). Ask for Marcela!







Piezo-time has come



For those heli pilots who have been wanting that "locked-in" tail-rotor feeling that only a piezometric gyro can give, but have been waiting for prices to come down, JR's new NEJ-900 Piezo Gyro is here. Like the earlier JR 1000 gyro, the 900 has the instantaneous response and most of the features of the 1000, but it retails for $150 less! The amplifier, sensor and remote gain controller of the NEJ-900 have been combined into one unit, and that makes mounting a snap. A simple three-connector hookup means quick installation. The amazing control and almost unlimited service life that a no-moving-parts piezometric gyro has to offer just became much more affordable. Contact: Horizon Hobby Distributors Inc., 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; website: http://www.horizonhobby.com.



Gold Bonanza

Top Flite now introduces its IMAA-legal (81-inch-span) Beechcraft Bonanza into the Gold Edition series. Over the past few years, the Gold Edition series has quickly become synonymous with excellent engineering and scale accuracy, and I don't expect the new 1/5-scale Beech to be an exception. With the Bonanza's unique profile and Top Flite's Gold Edition attention to detail, this should be a most rewarding project whether it's your first scale project or you've built dozens. The Bonanza kit can be built in either V-tail V35B or conventional-tail F33A versions. Kit features all-wood construction, D-tube wing design with interlocking I-beams, precision-formed ABS and internally concealed linkages and horns. Options include cabin detail kit, retracts, custom-fit navigation and landing lights. Specs: wing area—1,040 square inches; weight—11 to 13 pounds; length—63.6 inches; engine—.61 to .91 2-stroke or .91 to 1.20 4-stroke; radio—4- to 6-channel with six to nine servos. For more information, contact Great Planes Model Distributors, 2904 Research Rd., P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104; website: http://www.hobbies.net/topflite.

AIRWAVES

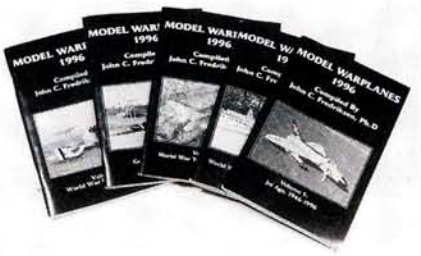
WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 100 East Ridge, Ridgefield, CT 06877-4606; email: man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous number of letters we receive, we can not respond to every one.

HOW 'BOUT A KING COBRA?

Plans and kits for most WW II fighters are readily available. However, to my knowledge, there are none for the Bell P-63 Kingcobra. The Confederate Air Force has a P-63F prototype. The tricycle landing gear and large vertical tail and underfin are desirable characteristics. The modeling world is saturated with P-51s; it would be nice if at least plans for a .40 engine P-63F were available.

STANTON BROWN
Tacoma, WA

While it's true there are a lot of P-51s in the modeling world, that's because lots of people like them. That's what's so neat about this hobby. If you want to build something, you can do it. There are no rules in that regard. Thus, what exists reflects what is desired.



According to John Frederiksen's "Model Warplanes 1996, Vol. 4"—$15 from John Frederiksen, 461 Loring Ave., Salem, MA 01970; (508) 745-9849—there are plans for a 70-inch-wingspan P63 available from Gleason Enterprises, 705 10th Ave. SW, Austin, MN 55912-2775; (507) 437-3781.

Our construction articles, like those of other magazines, come from the fertile minds of modelers like you. The P-63F would make an absolutely unique warbird. If you'd like to submit a construction article to us, we require construction photos, static and flight photos, specifications data and text that follows our construction article format. We'd be happy to consider your submission. LM

TWO FOR ONE

I enjoyed the article on building a simple hammerhead twin in the August '96 issue of *Model Airplane News*. I have been interested in twins for many years and would like to build a P-38. However, the bad experiences of others with twins have kept me from putting a lot of effort into a project that could be lost just because an engine quits. Like many other weekend flyers, I frequently have problems with engine performance, and having a major crash every time that happens would not be enjoyable.

Is it possible that many of the problems of twins could be solved if a single engine was used to drive the two props? I guess I got this idea from the drive system used in the electric P-38 by Kress Jets (*Model Airplane News*, November 1994). Has anyone tried this approach with fuel (non-electric engines)?

Such a setup might cause problems. Probably the most important question concerns the loss of efficiency. However, if the reduction in thrust is not excessive, it could be compensated for by light construction and low wing loading. Other problems such as engine starting and cooling might be dealt with as in ducted-fan and helicopter models.

DAN LOEGERING
Delmar, NY

It's impossible for me to know of all the attempts to belt-drive multiple props with a single glow engine, but I do know of one guy who's done it. It was our buddy Bob Kress, before he started using electric motors. He'd taken a Cox engine and powered a small B17 in much the same way as he's done with his electric systems.

But Dan, you've looked at Bob's idea of belt drives being driven off a single electric motor and thrown out the best part. Many people have discovered that the solution to multi-engine problems is to use electric motors. See Jim Ryan's P-38 (Model Airplane News, January 1997) for such an example. If you want to build larger aircraft, Dave Grife's been flying an IMAA-legal de Havilland Mosquito that weighs 14 pounds. He flies aerobatics with it and, well, it's pretty impressive. These planes not only have no engine-out problems; they have no engine synchrony problems either, as the series circuitry takes care of it for you. LM

COMPLETED CIRCUIT

I'm just one of thousands probably to send you a note on the wiring diagram in the April '97 "Airwaves" column. Of course, the series wiring diagram cannot possibly work, as you showed, without an additional connection between the two motors (+ to -) to complete the circuit. I wouldn't have written except that the article was supposed to be a correction or clarification, and as such, it was very confusing.

Good column otherwise, and I read it each month.

D.J. PIERSON
Via email

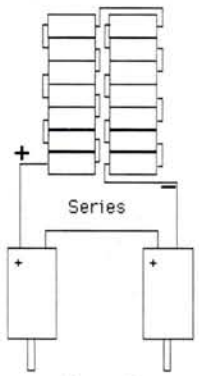


Figure 2

Oops! Of course you're correct, as there's no completed circuit in that diagram. Thanks for pointing out the error, and I'm glad you like the column. Its value is principally because of the great letters we receive from our readers.

Here's a corrected diagram of the series circuit. LM

MORE ABOUT RHINEBECK

It may interest your readers to know that a most complimentary article on Cole Palen and his Rhinebeck Aerodrome can be found in the October 1970 issue of *National Geographic*. Thank you for your wonderful article on the Rhinebeck Jamboree and your tribute to the man who helped to make it all possible.

DEAN CROFT
Halifax, Nova Scotia, Canada

Glad you liked our coverage of the 30th Annual Rhinebeck Jamboree. Many modelers have a soft spot in their hearts for Cole and his Aerodrome. I didn't realize that National Geographic had done an article on Cole, but now you have me searching for a copy of it. Thanks for the tip. LM

MODEL AIRPLANE NEWS

HOW TO

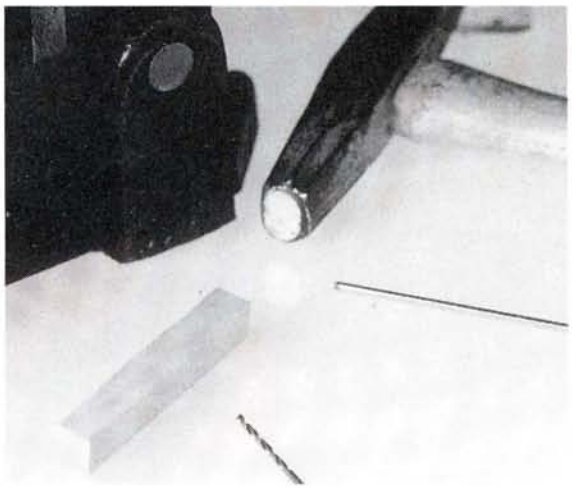
by RANDY RANDOLPH

EZ Z-Bends

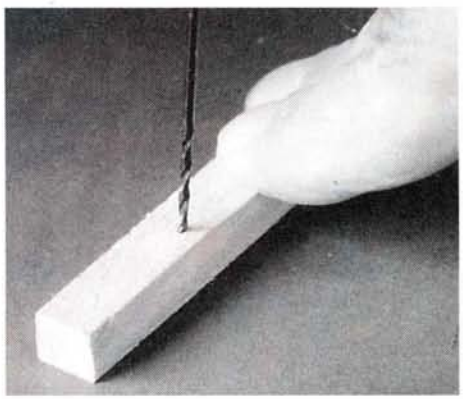
Quick servo connections

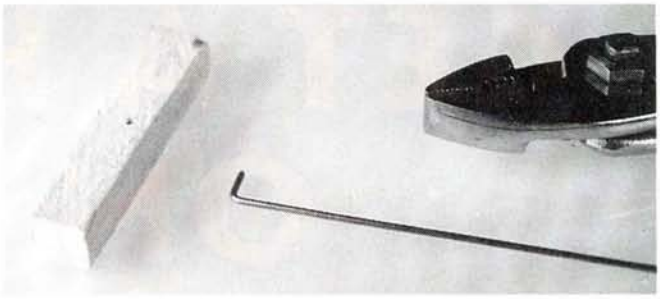
Modelers became acquainted with Z-bends about the time of the first U-control models. Up until then, there was little application for that funny-looking "quirk" in the end of a piece of wire as far as model airplanes were concerned. They have since become a way of life as well as a frustration when it is necessary to form one in the end of a piece of steel wire. The photos show a smooth and easy way to form these fancy bends in wire of almost any size.

1 *The necessary tools include: a vise, a hammer, a piece of hardwood and a drill bit that's the same size as the wire to be bent. The harder the hardwood, the better, but pine will work for wire with a diameter that's smaller than 1/32 inch.*



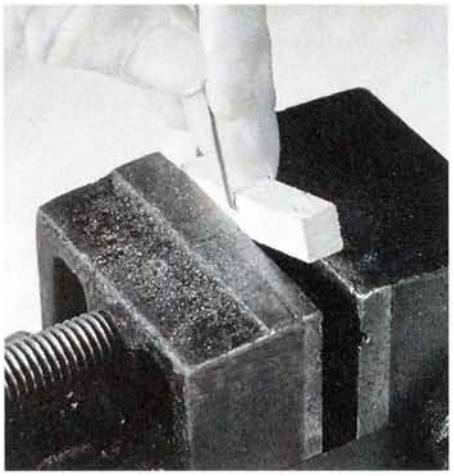
2 *Since this bend will be in 1/16-inch-diameter wire with a 1/8-inch hook and latch, drill the 1/16-inch hole 1/8 inch from the edge of the hardwood block. Drill the hole at least twice as deep as the intended latch (in this case, 1/4 inch).*

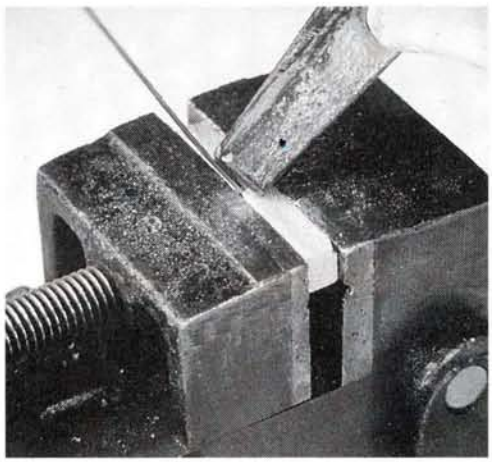




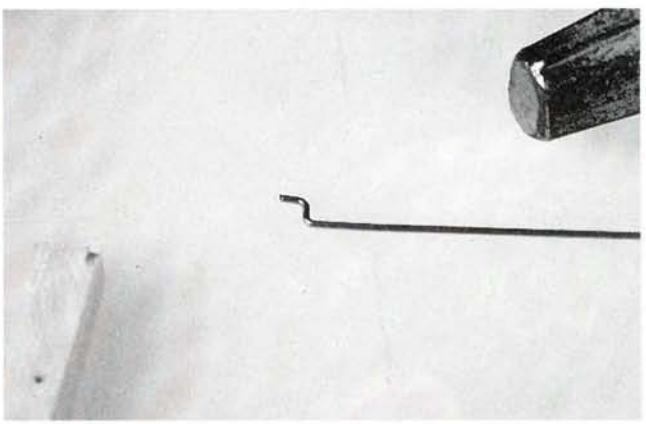
3 *Use the vise or a pair of pliers to make a right-angle bend in the end of the wire. This will form the latch of the completed bend and should be nearly twice as long as desired (1/4 inch for an 1/8-inch latch).*

4 *Insert the latch bend into the hole in the hardwood, and clamp the wire and wooden block tightly into the vise. To provide the hook width desired (here, 1/8 inch), the top of the wooden block should be even with the top edge of the vise jaws. The wire should be perpendicular to the vise and wooden block.*





5 *Hold the other end of the wire and bend it straight back from the jaws while tapping with the hammer at the site of the bend. Let the hammer do the work. When the wire is flat against the vise jaws, the bend is complete, and the wire can be removed from the vise.*



6 *The latch can now be trimmed to the desired length (1/8 inch in this example). Z-bends in larger wire can be made in this way if a mild steel (rather than hardwood block) is used.*

PHOTOS BY RANDY RANDOLPH

Pilot PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1997. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606.



SAY "CHEESE"!

Richard Bouslog of Lufkin, TX, built this Sig ¼-scale Cub and covered it with Sig Koverall and paint. He used Model Graphics Butch Andrews decals to dress it up. The model is powered by a YS supercharged 1.20, and Richard says that the Cub will knife-edge all day long. The pilot is from J&J Hobbies.

AN OLDIE BUT GOODIE

Ed Pease Jr. of Temecula, CA, sent this photo of his Scientific Mercury, which he first built 52 years ago. Ed tells us that back then, he powered the model with a Herkimer OK .60 engine, and one day, the plane "corkscrewed up at full throttle and then—at the bidding of the Austin timer—leveled off in a gentle turn to the left for a spiral descent to a 'kerplunk' landing not 10 yards away." He says that the O.S. .20 in the Mercury's nose today provides more than adequate power.





BASHED SEAMASTER

Herbert Swafford of Heath, TX, modified this Ace Seamaster kit by increasing its wingspan, making it a V-bottom and changing it to be a tail-dragger (combination tailwheel and rudder). He also added split flaps, tapered the wing, made a standard tail instead of a T-tail, increased the area of the vertical stab and rudder and powers the model with two Thunder Tiger .25 engines instead of a single .40 engine. Herbert tells us that the model flies beautifully!

ASTRO TROPHY RACER?

This bashed Sig Astro Hog is the king of the pond at the Flying Circus field in Camarillo, CA. Hugh O'Connell Jr. turned the Hog into a Schneider Cup racer by adding barn-door ailerons, raising the fuselage fore and aft of the cockpit and making a built-up epoxy/glass cowl. The model has a 72-inch wingspan, weighs 12 pounds, and with an O.S. 1.20 Surpass in its nose, the plane comes on the step in about 10 feet and takes off in another 50 feet.





SUPER TUCANO

Eugene Waters of Oak Ridge, TN, designed and built this 72-inch-span Super Tucano H model using a small 3-view he found in an *Aviation Week & Space Technology* magazine. He says that the plans he drew are a "compromise between the British Tucano and the Brazilian Embraer version." An Enya 1.20 4-stroke powers the model.

DOCILE CLASSIC



Mark Glazier of Duluth, MN, sent this photo of his Proctor Antic biplane. He powers the 64-inch-span model with a Saito 90 twin engine and uses pull/pull cables for the controls. The model's open framework is stained with lacquer-based cherry stain with a clear dope sealer; the covering is Sig Koverall.



AGUSTA 109A

Emile Sheriff of Ozark, AL, sent this photo of his Kalt Enforcer 2R heli in a Yellow Aircraft fiberglass fuselage. The model has working lights and doors, homemade retractable gears and a dashboard panel. Emile used K&B epoxy to outfit the heli in the colors of the company he works for—Northwest Airlink.



RED TAIL

Ben Yahr of Verona, WI, designed and built this model, which he calls "Red Tail." The built-up 2-meter glider weighs about 24 ounces and has elevator, rudder and flap control. It has a triple-taper wing with a 7037 airfoil, a slightly drooped nose and split tips. Ben says, "These tips may look funny, but watch a hawk in a thermal. ... If there are thermals out there, this design will find them."



SOUTH OF THE EQUATOR

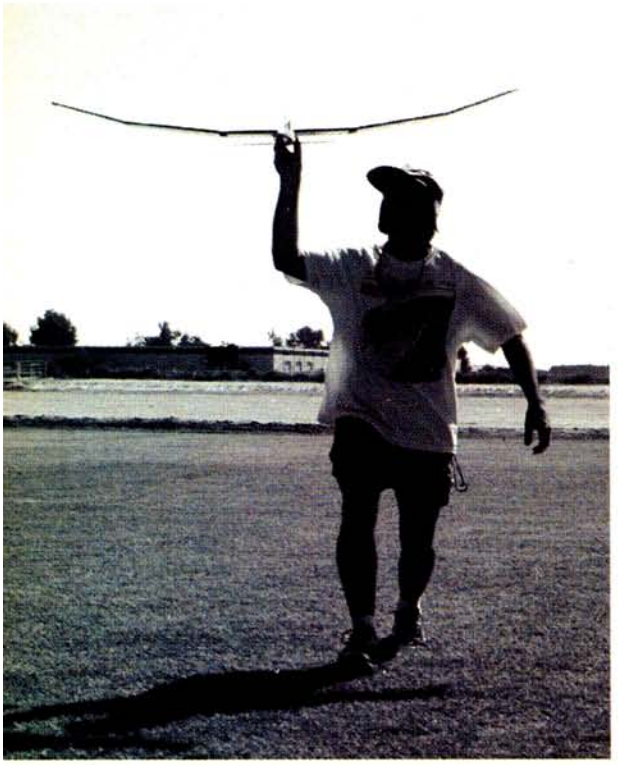
This 12-foot-span sailplane, "Hermann," is an original design of Chuck Howard, who lives in Quito, Ecuador. The model weighs 6½ pounds, has 10.1 ounces per square foot of wing loading and has rudder, aileron, flap and full flying elevator control. Chuck used Compufoil to draw the model's S3021 airfoil and says that the model tracks straight and true, has tight, stable turns, loves to climb in a thermal and will nearly hover with full flaps in a light breeze.

Hand-Launch

PRODUCT

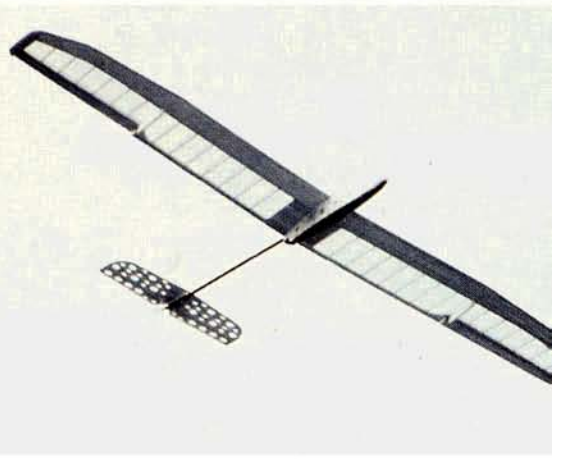
by DAVE GARWOOD

Small wings, big fun



Fred Mallett tests the Epsilon for balance and stability with the radio off at Visalia, 1996.

FOR THOSE WHO SEE beauty in simplicity, R/C flying doesn't get much more beautiful than this. Hand-launch gliders (HLGs) are the purest form of R/C flight. Forget motors and propellers; forget winches and high-starts. HLG leaves only you, your plane and the air. Flying hand-launch provides an unparalleled opportunity to see your plane in flight, to see the results of your control inputs and to learn to read the air.



Dodgson Designs' Orbiter-2 flown by Steve Cameron to victory at the 1995 AMA/LSF National Championships. Aileron, rudder and elevator control with only two servos.

HLGs can be the least expensive thermal sailplanes, but the immensely satisfying feeling that comes from throwing your plane into a thermal and riding it upward until it's a speck in the sky is one of the greatest kicks in model flight.

Since, under AMA rules, the distinguishing characteristic of the hand-launch sailplane class is simply a limitation of wingspan to 1.5 meters, or 60 inches, construction materials and methods vary widely. Just like those of larger sailplanes, HLG wings may be built up from sticks and balsa sheet or may be foam-cores sheeted with balsa, obechi, fiberglass, or carbon fiber. Fuselages may be wood or composite materials and can be pod-and-boom or fully shaped. Tailplanes may be conventional, T-shape, or V-shape.

Control systems follow common R/C sailplane practice. Two-channel polyhedral ships with rudder and elevator work well for newcomers because they are lighter, fly a little slower and require simpler and less expensive radio equipment—a basic 4-channel transmitter, a small receiver and a pair of mini or microservos will do for most polyhedral planes.

As with other soaring classes, sophistication increases rapidly, and we also see full-house aileron HLGs with four servos and computer radios to mix V-tails, aileron and rudder to provide spoilerons for glide-path control, to reflex the ailerons for launch, or to camber the wing for thermalling.

Current HLG design strives for an all-up weight in the neighborhood of 10 to 14 ounces. Sixty-inch-span sailplanes can be built at 9 ounces or lower, but they begin to get noticeably delicate, suffer limited receiver battery life, and some feel they become too light to launch well. As weights approach 15 and 16 ounces,

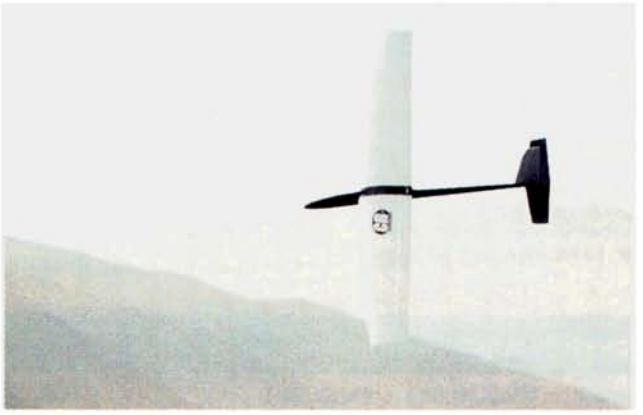


A competitor finishes a flight with a midair catch at the 1996 Fall Soaring Festival in Visalia, CA.

Sailplane GUIDE



HLG event at the 1996 Fall Soaring Festival in Visalia, CA.



Dave Garwood's four-servo CR Aircraft Climmax over Lake Hodges in Southern California.

the plane starts to get too heavy for many to throw, and hang time suffers.

We used to call 60-inch, 16-ounce planes "hand launchers," but now we call them "light-air slope ships." HLGs have gotten lighter. Note, however, that HLGs make many landings in a flying session, and until you become proficient at landing shiny side up, you may be happiest with a tougher HLG, and these often weigh 16 to 18 ounces. Installing microservos, micro receivers and small battery packs lowers the flying weight but raises the cost.

An HLG may not be the best choice for a *first* R/C airplane, due to the high number of landings in a typical HL flying session, but once you learn to fly and land an R/C sailplane, there is a lot to like about hand-launch.

Because you're closer to the plane and you can easily see what it's doing in reaction to the air it's flying through, you can teach yourself a lot about flying sailplanes. Dave Thornberg taught us, "You learn a lot more about your sailplane and yourself below 50 feet than above 50 feet."



Joe Hahn circles a DJ Aerotech Monarch at the 1996 AMA/LSF National Championships in Muncie, IN.

Culpepper Models Chuperosa: a Built-Up HLG

When asked which kit is suitable for a beginning hand-launch flyer, I recommend the Culpepper Models* Chuperosa because it's sturdy, it's relatively easy to build, and it has a long list of very happy owners.

CONSTRUCTION

I made up the wing skins from the hand-selected 1/32-inch balsa stock and vacuum bagged the wings using PJ's epoxy. Vacuum-bagging is the easiest method for me to produce strong and lightweight wings, although instructions are provided in the kit for sheeting the wings without vacuum-bagging equipment. Final finish on the wing was two very light coats of water-based urethane varnish to keep final weight to a minimum.

Fuselage construction is pretty straightforward using the light plywood, balsa and spruce parts supplied in the kit. For weight reduction, I cut holes in the rudder and fin using an Olfa circular cutter—basically, a compass with a knife blade instead of a pencil.

I used Oracover* Lite to cover the stab, rudder, fin and tail boom. MonoKote* was used on the remainder of the fuse. I used two Hitec* 80 servos, along with an RCD 535 receiver. The receiver battery is a small 225mAh 4-cell pack. My final ready-to-fly weight was a very respectable 14.3 ounces, though some Chuperosas weigh as much as 17 ounces. Remember to take your time and think light; you'll be glad that you did.



FLYING

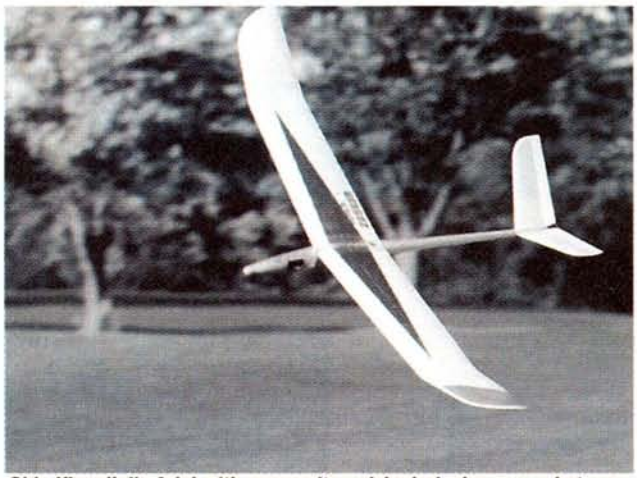
I could hardly wait to fly my new "Chup." The temperature was a cool 20 degrees with winds at 10mph with gusts. But no problem; after a few easy hand tosses and minor trimming, the Chup was doing what it does best: flying in light lift and making its way gracefully around the sky very steadily despite the winds. The following day, my mentor, Bob Powers, joined us, and the winds were only about 5mph. Dave Garwood, Bob and I had a real blast flying my newest Chup. Everyone there remarked on how great the Chuperosa flew, and each wanted another turn at the sticks. It was a pleasant change from the dreary winter blues.

Flying the Chuperosa is a relaxing experience, as it's stable and forgiving. My new Chup, like the others, lives up to its well-deserved reputation as a great choice for beginning hand-launch builders and flyers.

—Steve Miller

Also, because you *do* get plenty of landing practice, your landing precision improves rapidly. Whether you use this skill to notch up your contest scores or just to save wear and tear on the old feet, shooting 40 to 50 landings in a flying session gives you a chance to improve your accuracy and smoothness.

In addition to the low cost and quick construction of introductory HL sailplanes, a sterling advantage is you can fly them at more places than just about any other R/C aircraft. A baseball diamond or a soccer field is large enough for hand-launching.



Chip Vignolini's Ariel with composite polyhedral wing was a hot performer on the HL golf course at the 1996 AMA/LSF National Championships in Muncie, IN.

Hand-launch sailplanes have experienced a great leap forward in recent months. Development in HLGs is racing along at a furious pace, far ahead of any other part of the sailplane scene (with the possible exception of foam slope soaring combat planes). Half of HLG planes and many of the HLG makers listed here did not exist a year ago. This is good news for modelers.

As in other areas of the model industry, often the newest designs—those utilizing the most advanced technology and those with the most innovative design features—come from the

Sport and Trainer Hand-Launch Sailplanes

Manufacturer	Model	Wing	Fuselage	Wingspan (in.)	Weight (oz.)	Price
Airworks	**1/10-scale HP-18**	Foam/composite	FG	60	11	$200, ARF
Chip Vignolini	**Ariel**	Foam/composite	FG	60	11-12	$100, kit w/cores; $120, pre-sheeted kit; $210, pre-built
CR Aircraft Models	**Climmax**	Foam/balsa	Wood	60	15	$64.95
Culpepper Models	**Chuperosa**	Foam/balsa	Wood	60	17 & up	$60, kit (polyhedral); $69 w/ailerons
Culpepper Models	**Hummingbird**	Foam/balsa	Wood	60	18 & up	$69, kit; $129 w/pre-sheeted wing
David Layne Designs	**Saturn HL**	Foam/obechi	FG/Kevlar	59	15-17	$99, kit; $149 w/presheeted wing
DJ Aerotech	**Chrysalis**	Wood	FG			$49.95
Dodgson Designs	**Pivot**	Foam/obechi	FG	60	18	$85
Dream Catcher Hobby Inc.	**Wind Weasel**	Wood	FG	60	15	$59.95
Great Planes Model Dist.	**Dynaflite Skeeter**	Wood	Wood	55	12	$27.95
Hobby Lobby Int'l	**Handsel 1200**	Wood	FG	59.5	10.3	$159
Hobby Lobby Int'l	**Bella**	Wood	FG	59	13	$118
Hobby Lobby Int'l	**Discus LS Mini**	Wood	FG	59.5	11.6	$119
Hobby Lobby Int'l	**V-Star**	Wood	FG	57.5	12.25	$159
Hobby Lobby Int'l	**Viki-2**	Wood	FG	55	14	$118.90
Joe Galletti	**Bob**	Foam/ply	Foam/ply	60	10.6	$50
MM Glider Tech	**Illusion**	Wood	Wood	55.25	10-13	$41.95
Northeast Sailplane Products	**Pitch Moth**	Foam/balsa	FG	60	12-18	$59.95
Northeast Sailplane Products	**Blues HLG**	Wood	FG	60	13	$199.95
Northeast Sailplane Products	**Neon**	Foam/balsa	FG	59	13	$69.95
Specked Soaring Equipment	**M 60 P (polyhedral)**	Foam/composite	FG/Kevlar	59	11-14	$120, ARF

FG = fiberglass
All addresses are listed in the Index of Manufacturers on page 124.

Competition Hand-Launch Sailplanes

Manufacturer	Model	Wing	Fuselage	Wingspan (in.)	Weight (oz.)	Price
Airtronics	**Gem**	Foam/balsa	FG	60	11.5-14	$99.95, kit; $169.95 w/pre-sheeted wing
Blue Feather Entertainment	**Poquito**	Foam/balsa	FG/Kevlar	55/60	8.5-14	$79.95, kit; $99.95 w/pre-sheeted wing; $299.95, pre-built
Bob Sliff's Models	**Gnome**	Wood	Wood	60	12-13	$37.95
CR Aircraft Models	**Climmax Pro**	Foam/balsa	FG	60	13	$179.95
CR Aircraft Models	**Climmax FG**	Foam/balsa	FG/Kevlar	60	13-15	$99.95, kit; $179.95, pre-built
CR Aircraft Models	**Climmax PF**	Foam/balsa	FG/Kevlar	60	13	$189.95
David Layne Designs	**Saturn HL-2**	Foam/composite	FG/Kevlar	59	9-12	$169, ARF
DJ Aerotech	**Monarch C**	Foam/balsa	FG/carbon	59	8.5-11.5	$175
DJ Aerotech	**Monarch CX**	Foam/balsa	FG/carbon	59	11-13.5	$195
DJ Aerotech	**Wizard**	Foam/balsa	FG	59	10.5-12.5	$195
Dodgson Designs	**gf78**	Wood	FG	59.5	12.5	$75; $85 w/2-piece wing version
Don Peters	**Maple Leaf 3 RG15**	Foam/composite	FG/Kevlar	60	11.25	$250, ARF; $325, pre-built
Don Peters	**Maple Leaf 3P**	Foam/composite	FG/Kevlar	60	9-9.5	$250, ARF; $325, pre-built
Dream Catcher Hobby	**Viper Pro (V-tail)**	Foam/balsa	FG	60	13.5	$129.95; $179.96 w/pre-sheeted wing
Dream Catcher Hobby	**Viper RG (std. tail)**	Foam/balsa	FG	60	13	$129.95; $179.96 w/pre-sheeted wing
Dream Catcher Hobby	**Viper**	Foam/balsa	FG	60	13	$129.95, kit; $179.96 w/pre-sheeted wing
Dream Catcher Hobby	**Viper V**	Foam/balsa	FG	60	13	$129.95, kit; $179.96 w/pre-sheeted wing
Fox Models	**WASP II**	Foam/balsa	FG	59.75	10-11	$100; $155 w/presheeted wing
Hobby Lobby Int'l	**Handy**	Wood	FG	55	12.5	$139
K&A Models Unlimited	**Quest**	Foam/balsa	FG	60	11-12	$69.99
K&A Models Unlimited	**Request**	Foam/balsa	FG	60	11-12	$69.99
K&A Models Unlimited	**Thermal Buster**	Wood	FG	59	11-13	$59.99
McBurnett Productions	**Blu-Dartar**	Foam/balsa	FG	58	10-13	$160
Northeast Sailplane Products	**Epsilon**	Foam/composite	FG	59.5	10.5-11.8	$200
Northeast Sailplane Products	**Corn Dogger Classic**	Foam/composite	FG/Kevlar	59	10.5	$189.95
Northeast Sailplane Products	**Obsession**	Foam/balsa	FG	59	10-11	$129.95
Northeast Sailplane Products	**Obsession C**	Foam/composite	FG	59	11-13	$199.95
R/C Direct	**Handy**	Wood	FG	59	7.5-8	$96, RTC; $118, ARF
Sky Bench Aerotech	**Li'l Bird 2**	Wood	Wood	60	10	$49.95
Sky Bench Aerotech	**Osprey 1**	Wood	FG/wood	59	10	$69.95
Slegers International	**Vertigo**	Foam/balsa	FG	60	11-13	$79.95
Soaring Specialties	**Lancer HLG**	Foam/balsa	FG/wood	58	10-14	$59.95
Specked Soaring Equipment	**M 60 A (aileron)**	Foam/composite	FG/Kevlar	59	13-16	$120, ARF
Weston Aerodesign	**Mosquito**	Foam/composite	Kevlar	58.5	8.5 - 11	$179.95, ARF
Wilkerson Performance Aircraft	**Hairstreak**	Foam/balsa	FG/carbon	60	11-17	NA

FG = fiberglass
All addresses are listed in the Index of Manufacturers on page 124.

Hobby Lobby Handsel: a Pre-built HLG

The Handsel from Hobby Lobby* fills the needs of those who want a sport hand-launched sailplane but don't have time to build one. Built in Czechoslovakia, it reflects the high quality of workmanship we're used to seeing from products exported from that country.



CONSTRUCTION

It comes with a pre-built/pre-covered wing. The fuselage is fiberglass, and the only work necessary here is to mount the servo rails and wing-mounting block. You must hinge the tail surfaces (using tape) and glue them to the fuselage. I had the plane ready for radio gear in about 30 minutes.

All hardware for radio installation is provided, and it's a simple matter to run the linkage cables and mount the servos. I used Hitec HS80 microservos, a Futaba* RF148 receiver and a 225mAh receiver pack to provide control. I found that with this setup, both the receiver and battery must be as far forward as possible to balance the plane. With this gear, my Handsel weighed 12.9 ounces.

FLYING

While you give up a bit in performance, the low-aspect wing design makes the Handsel very nice to transport, as the shorter wing means you can put it in just about any vehicle without having to take it apart.

Flying the Handsel is easy for anyone with experience flying a rudder/elevator plane. It's not as sensitive as some of the competition planes I've flown, but that suits the style of the

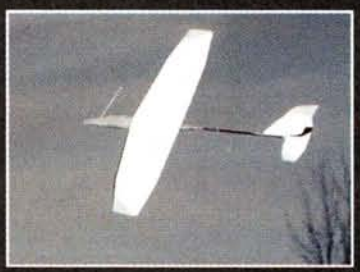
smallest makers. I can offer a word of wisdom from experience: if you see something you like, don't hesitate to order it because the maker may not be in business years or even months from now.

Keep in mind, as you narrow down the choices and select your next HL sailplane, that design decisions are compromises. When you're scratching for altitude in weak lift, you yearn for a light aircraft, but they are not as strong. When you land in a tree, you wish for a strong aircraft, but they are not as light. Choose an HLG suited to your present skill level to ensure long-term happiness.

The centerpiece of this article is a survey of HLG makers, in which I present a summary of the designs and the kits available on the market today. I offer descriptions of 56 HLG sailplane designs given to us by 27 makers.

AIRWORKS EPSILON: COMPETITION HLG

Visalia is the largest soaring meet of them all, and it brings out the best and the newest. Generally, it's dominated by Californians—the guys who design and fly more sailplanes than anybody else on the planet. But in 1995, Texan Fred Mallett won the HL contest, and in 1996, he returned with his new HL design, the Epsilon.



I watched Fred launch the plane into a split-S (half roll, then half loop). He impressed the crowd with launches high enough and thumbs good enough to perform two outside loops and then fly the plane back for a hand catch.

Is it the plane or the pilot that enables such outrageous flight performance? It's the pilot, of course. But I've noticed that the best pilots want to fly the best planes.

Fred handed me the transmitter, and I found his aileron Epsilon a joy to fly. I got 25-second flights in still air. I easily flew an inside loop from hand launch. With a mighty heave from Sal DeFrancesco, I flew a split-S, circled back and caught the plane in midair.

Later, I flew a polyhedral version of the Epsilon and found that it exhibited exceptionally smooth and stable flight. This plane launches high, responds to control inputs instantly and delivers outstanding hang time. It's easier to hold in a thermal turn than is the aileron version, as you would expect. Both versions offer state-of-the-art performance for contest flyers and HL hot-doggers.

I haven't built an Epsilon yet, but Joe Chovan has, and his construction report follows. ***—Dave Garwood***

CONSTRUCTION

Airworks'* aileron-version Epsilon arrived from NSP as an ARF, with superior competition-quality lightweight vacuum-bagged carbon wing and tail surfaces, a lightweight pigmented resin/glass pod molded to a carbon boom, a light hardware pack and instructions.

The builder must hinge the ailerons, rudder and elevator, install servos, align and mount the wing and tail surfaces. This takes roughly two days.

Airworks' instructions are complete and give innovative construction tips. Especially notable are the skin-hinging method employed on the tapered ailerons and elevator and the pull/pull cable installation through the tail boom to both elevator and rudder. Modifications explained in the instructions allow the plane to be packed in a rifle case for transportation.

The target weight of 13 ounces is easily obtainable if the recommended construction techniques and micro radio gear are used. My model weighs 11.2 ounces with four HS-60 servos and a 225mAh battery pack.

The Epsilon is a clean and durable combination for a fast and nimble HLG. In short, the plane is built to fly well and to let you keep on flying it. Fred knows that to fly well, you must practice, and he has given you a weapon to do so often and anywhere. It's a plane you want to fly.

—Joe Chovan

plane, and it's very much at home on small fields.

POSSIBLE MODIFICATION

One thing I changed on my Handsel was the wing-mounting system. It uses a single, large bolt to hold the wing on, and while this works, you're constantly correcting the wing position after landing and trying to tighten (overtighten?) the bolt to hold it in place. I simply drilled another hole in the back of the wing and into the fuselage and used a 4-40 nylon bolt to keep everything aligned.

If getting into the air quickly is important to you, I recommend that you give the Handsel some consideration, as it may answer your needs.

—Larry Marshall



The new DJ Aerotech Chrysalis—a low-cost two-servo built-up balsa sailplane for sport and beginning competition flying. (Photo by Don Stackhouse.)

Whichever hand-launch sailplane you choose, you're sure to have fun. I hope that this survey, and its three mini-reviews of a pre-built, built-up and competition-class sailplane will help you choose the one that suits your needs.

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.* ✚

About the author

Dave Garwood has built and flown model airplanes for more than 30 years and has built and flown R/C sailplanes for eight years. He flies hand-launch gliders, larger thermal duration sailplanes and slope soarers. Dave has written 29 sailplane kit reviews and is the thermal soaring columnist for Model Aviation magazine.

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9x4, 9x5, 9x6, **9x7**, 9x8, 9.5x6. $1.69
10x4,**10x5**, 10x6, 10x7, 10x8, **10x9** $1.99
11x4, **11x5**, 11x6, 11x7, 11x7.5, **11x8**, 11x9, **11x10** $2.19

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13x6, 13x8 $3.99
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15x8, 15x10 $6.59
16x6, 16x8 $7.59

Classic Series



black, glass-filled nylon
16x6, 16x8, 16x10. $7.95
18x6, 18x8, 18x10 $13.25
20x6, 20x8, 20x10. $15.25

Scimitar Series



charcoal gray, glass-filled nylon
7x4, 7x5, ... $1.49
8x4, 8x5, 8x6 $1.59
9x5, 9x6, 9x7 $1.79
10x5, 10x6, 10x7, 10x8 $2.09
11x6, 11x7, 11x8. $2.29
12x6, 12x8 $2.99
13x6, 13x8, 13x10 $4.29
14x8, 14x10 $5.99

Wood Series



beechwood or maple
9x4, 9x5, 9x6, 9x8 $2.10
10x5, 10x6, 10x7, 10x8. $2.40
11x6, 11x7, 11x8, 11x10 $2.70
12x6, 12x8, 12x9. $3.45
13x6, 13x8, 13x10 $4.20
14x6, 14x8, 14x10 $5.55
16x6, 16x8, 16x10 $9.50
18x6, 18x8, 18x10 $15.00
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22x8, 22x10, 22x12. $19.25
24x8, 24x10, 24x12 $21.00

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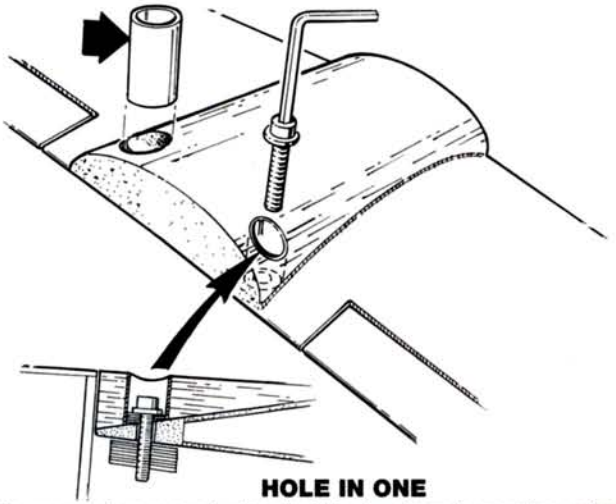
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Hints & KINKS

by JIM NEWMAN

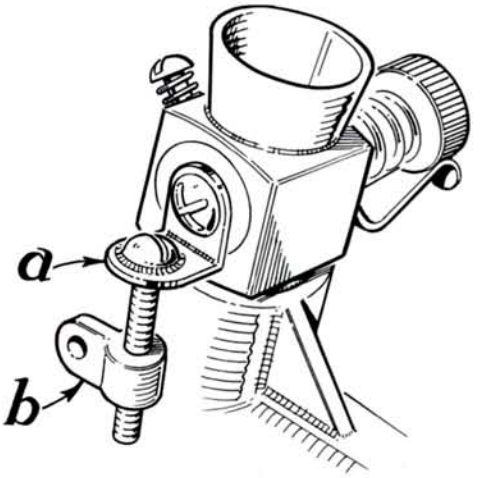
Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



HOLE IN ONE

To prevent recessed wing-bolt holes from becoming misshapen, glue in a suitable stout tube, e.g., a model rocket tube, a pill container or a cigar tube, then sand it flush with the fairing. If the hole is deeply recessed, use an Allen-head nylon screw such as that made by Wing Mfg. A dab of clay or Silly Putty will enable the Allen key to withdraw the bolt or screw.

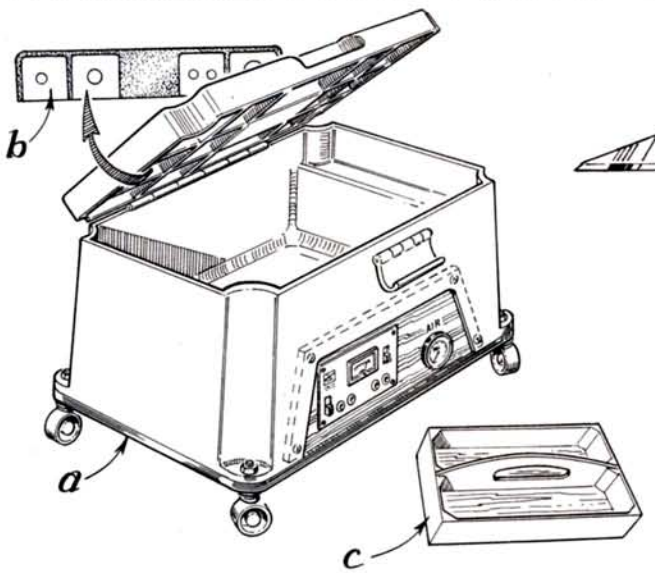
Greg Hildebrandt, Winimac, IN



FINE-TUNE THROTTLE

A steel or brass bracket (a) that's about .025 inch (0.5mm) thick has a 6-32 machine screw soldered to it. This allows the use of a nylon aileron horn bracket (b) for very fine adjustment of the throttle-arm throw.

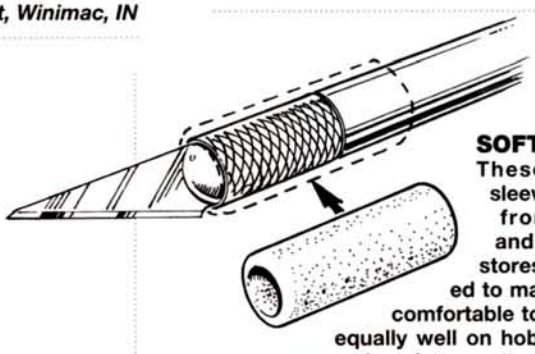
Bob Robert, Durrington, Wilts, England



STOOL PIGEON

Convert this Rubbermaid® plastic step stool into a caddy/field box. A thick plywood base (a) is retained by the four castering wheels. A plywood electrics front panel is mounted between the legs. The plywood supports an air gauge for the compressor, which is behind a ply divider. There is also room for other stuff underneath and inside. Drill (or melt) holes in the stiffening webs (b) to hold screwdrivers, Allen keys, a plug wrench, etc. Make a lite-ply tray (c) to rest on the ledge inside. Oscar also has a second unit that he uses to hold 2- and 4-stroke-engine fuel cans and pumps. Note: for safety, the battery should be mounted separately from the cans and with a plug-in lead across to the electric panel so that the fuel unit is "dead" for transporting.

Oscar Cano, Col. Roma, Mexico



SOFTY KNIFE

These foam-rubber sleeves are available from stationery- and drafting-supply stores and are intended to make pencils more comfortable to use. They work equally well on hobby knives, as your columnist can attest.

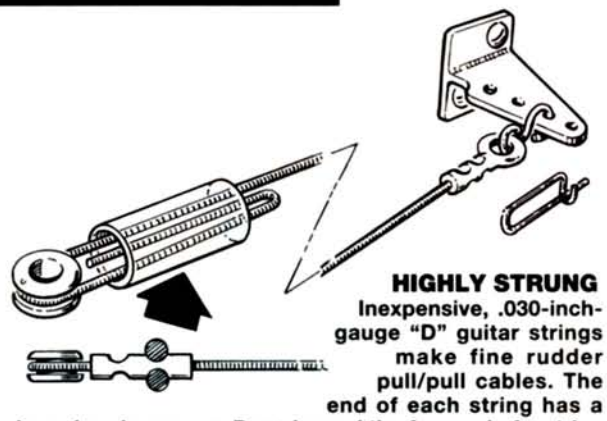
Dan Lutz, Fallbrook, CA



HIGH-COMPRESSION BOW

To make a neat foam-cutting bow, use a tubular aluminum spring-loaded shower-curtain rod. Stout birch plywood brackets are glass-taped and epoxy-glued to each end as shown. The ni-chrome wire is attached to metal eyes screwed into the bottom of the brackets; the force of the spring keeps the wire tight.

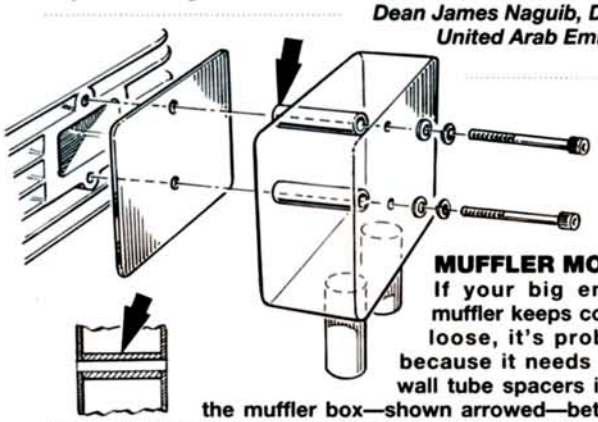
Paulo Salvado, São Jose Dos Campos, Brazil



HIGHLY STRUNG

Inexpensive, .030-inch-gauge "D" guitar strings make fine rudder pull/pull cables. The end of each string has a crimped-on brass eye. Dean looped the free end of a string through the eye after passing the string through the rudder horn. Music-wire S-hooks or a simple aircraft-style safety pin will allow the string to be quickly removed for service. Pass the forward end of the string around a metal thimble before crimping on thick-wall, soft brass or copper tube with round-nose pliers. Snap a clevis onto the thimble to adjust the length.

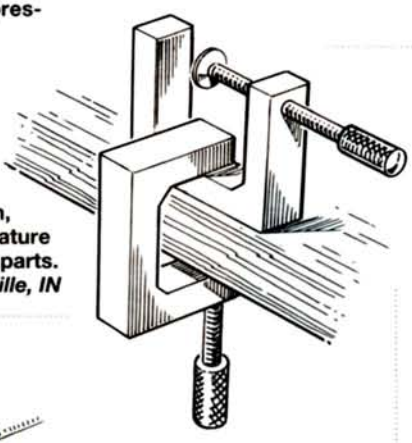
Dean James Naguib, Dubai, United Arab Emirates



MUFFLER MOD

If your big engine muffler keeps coming loose, it's probably because it needs thick wall tube spacers inside the muffler box—shown arrowed—between the back and front of the muffler. These tubes prevent the muffler from being crushed as the screws are tightened and transfers the compressive force of the screws to the cylinder muffler lugs.

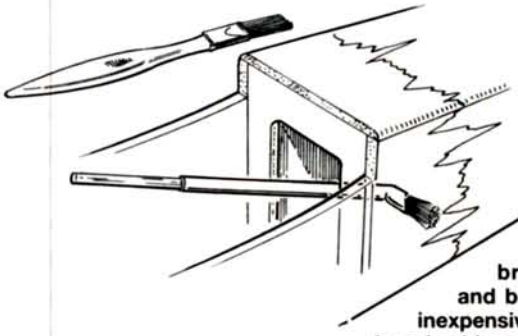
Will Enns, Abbotsford, BC, Canada



MINI VISE

Two small clamps, arranged as shown on the edge of a bench, offer the convenience of a miniature vise when you work on small parts.

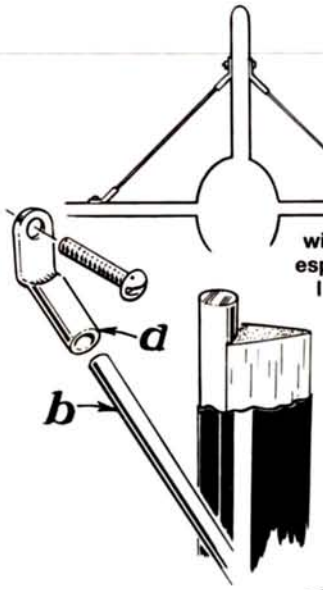
Ken Wilson, Evansville, IN



THE BRUSH OFF

To apply glue or resin to fiberglass inside the structure especially after a repair, use long handle brushes. A special brush can be made by kinking and bending the metal handle of an inexpensive acid brush and extending its length with a dowel jammed in the end.

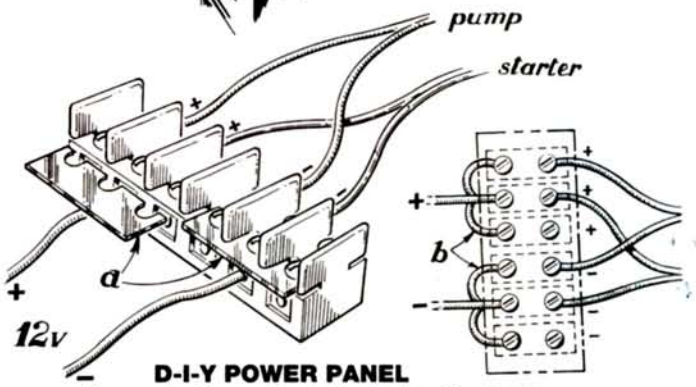
Saeed Rahimi, Tehran, Iran



FOR LUG NUTS

Heavy-duty electrical lugs can be soldered to music wire to make bracing wires—especially useful on the tail. If light struts are needed, a balsa fairing can be CA'd to the wire, then covered with shrink sleeve or covering film.

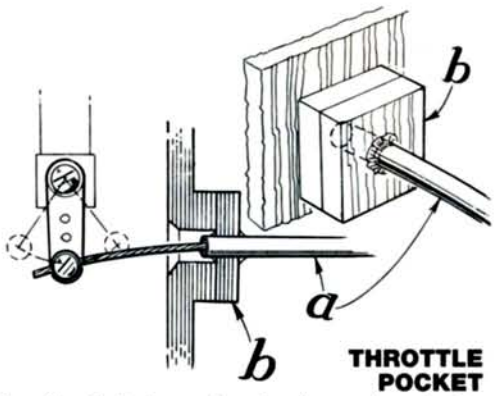
F. Burman, Nowra, NSW, Australia



D-I-Y POWER PANEL

If you don't need a full electronic starter panel, then a simple Radio Shack barrier strip will suffice. Metal bus bars (a) clamped under the screws link one side to the positive and negative terminals of the 12V battery. Take positives and negatives from the opposite sides to power your pump and starter-motor sockets, as shown. Two spare outlets are for a low-voltage soldering iron if needed. If you don't have bus bars, you can use wire jumpers (b) to link the terminals on the battery side.

David Gell, Ann Arbor, MI



THROTTLE POCKET

Often the 4-stroke carburetor is so close to the firewall that the throttle cable kinks. Move the cable conduit (a) farther aft by using spacers on the back face of the firewall to create this pocket (b) so that the push/pull cable flows smoothly in and out without any sharp kinks.

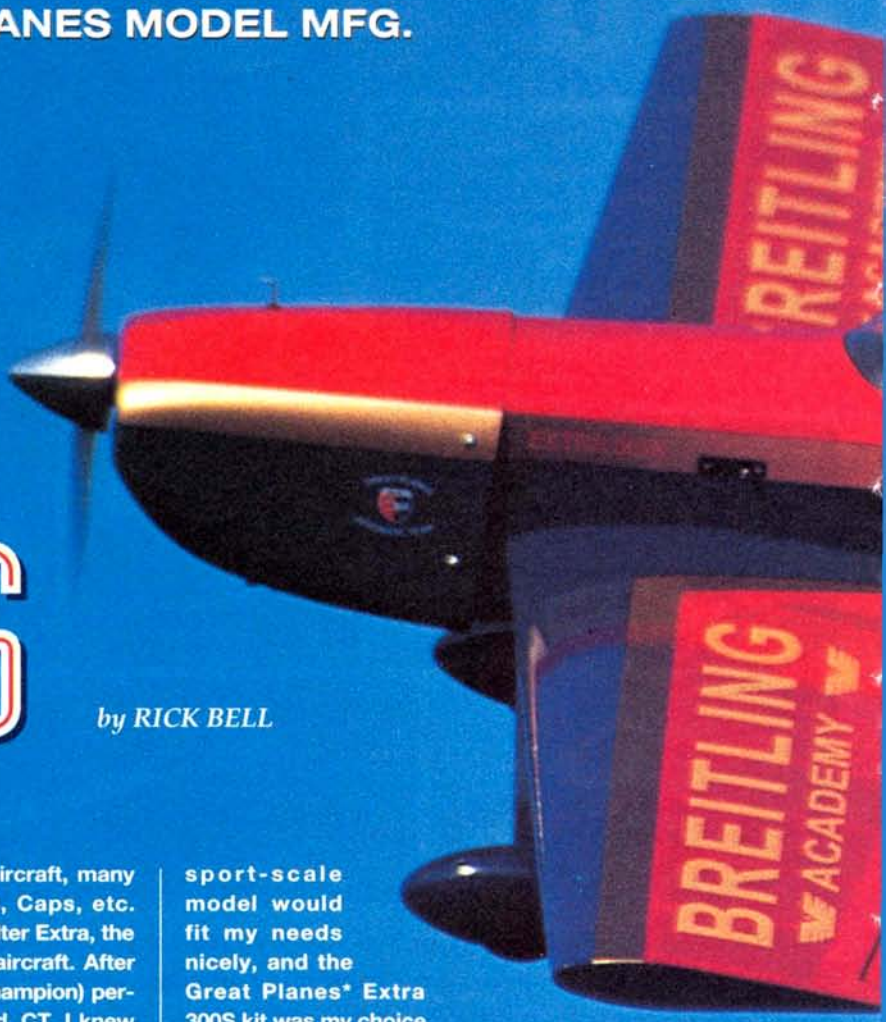
Mariano Alfarara, Mt. Clemens, MI

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

GREAT PLANES MODEL MFG.

Extra 300s



by RICK BELL

WHEN YOU THINK of full-scale aerobatic aircraft, many come to mind: Pitts Specials, Sukhois, Caps, etc. However, for me, it means Extra. Designed by Walter Extra, the Extra 300S is one of today's premier aerobatic aircraft. After seeing Michael Goulian (current U.S. aerobatic champion) perform at an airshow at Brainard Airport in Hartford, CT, I knew that I wanted to build a model of one. Not having a lot of time to build one of the larger versions, I decided that a .40-size sport-scale model would fit my needs nicely, and the Great Planes* Extra 300S kit was my choice.



Larry Marshall helps Rick Bell power up the O.S. .46FX.

THE KIT

When you open the box, you will see a well-packaged kit. All parts are bundled together to prevent damage. The kit comes with die-cut balsa and plywood parts, rolled plans (two sheets) and a complete accessory package that includes an adjustable, glass-filled engine mount, pushrods, horns, hinges, two-piece ABS cowl and wheel pants, preformed aluminum landing gear, a great-looking canopy, hardware package and decal sheet.

Kudos to Great Planes for the instruction manual. It is very complete with pictures that cover all steps of construction, a list of required accessories, a die-cut pattern guide, check-off boxes, a list of required tools and supplies and "Expert Tips." For example, it details how to mark and cut hinge slots, bevel leading edges and join control surfaces. The manual also covers in detail covering, balanc-

Put on your own airshow!



ing, painting, setup (control throws) and flying the model. To get the best performance from the model, there is also a handy field guide for flight trimming.

TAIL FEATHERS

For all construction, I used Pacer's Zap* CA and CA+ and Hobbypoxy* Formula II where appropriate. The stabilizer, elevators, fin and rudder are built from ¼-inch sticks and ¼-inch sheet cut to size to build open-truss framework surfaces. A nice touch is the bevel gauge included to aid cutting the angles of the stab leading edge and the stab ribs. It works well. After I built the tail feathers, I sanded them, rounded the edges, joined the elevators and hinged everything. Note: none of the tail surfaces are sheeted with balsa. This is to help save some weight.

WING

The wing is built upside-down directly on the plans. The ribs have jig tabs (top and bottom) to build in the dihedral and wing taper. No washout is built into the wing, because it would detract from flight performance. Construction goes very quickly and easily. Be sure to

SPECIFICATIONS

Model: Extra 300S

Type: sport-scale aerobatic

Manufacturer: Great Planes

Wingspan: 58 in.

Wing area: 594 sq. in.

Wing loading: 23.3 oz./sq. ft.

Weight: 6 lb.

Length: 48 in.

Engine req'd: .40 to .51 2-stroke or .48 to .70 4-stroke

Engine used: O.S. .46FX

List price: $179.99

Features: built-up D-tube wing construction; full symmetrical airfoil; interlocking balsa/ply fuselage; comprehensive, photo-illustrated construction manual; preformed duraluminum landing gear; two-piece ABS cowl and wheelpants; complete hardware package; clear canopy; decal sheet.

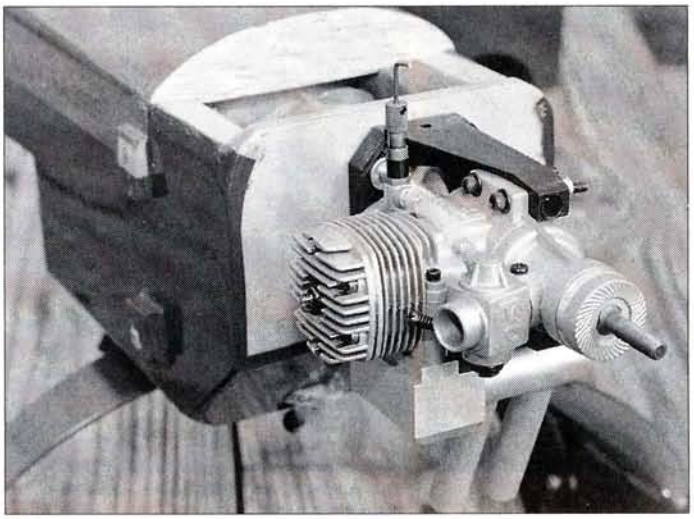
Comments: the Extra 300S is an easy, quick-to-build aerobat. It's very smooth, yet crisp without being twitchy. It takes off predictably and lands solidly. It looks great when flying or waiting for its next performance.

Hits
- Ease of construction.
- Excellent instructions.
- Looks great.
- Outstanding flight performance.

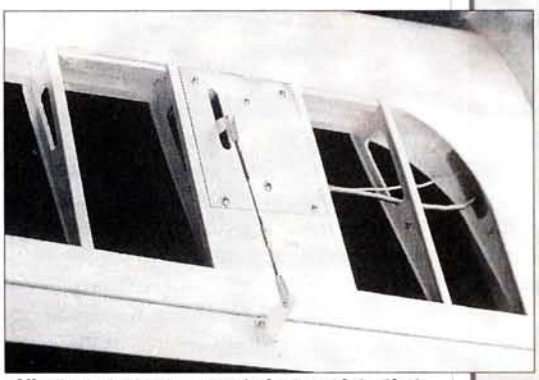
Misses
- Hard balsa for some ribs.
- Incomplete die-cutting on some ribs.

PHOTOS BY RICK HILL & WALTER SIDAS

follow the instructions about where to use T-pins. If you don't, they will be difficult to remove later. After the top main spar has been pinned and shimmed (remember the wing is tapered!), add the ribs, the bottom spar, leading and trailing edges and shear webs. The only problem encountered was that some of the ribs and shear webs were not completely die-cut. The wood was very hard, and I had to use a scroll saw to cut them out. Next, I added the LE and TE sheeting. The panel was then removed, and the other panel was built. The panels were then flipped over (upright) and joined, being very careful to glue them together without any twist. The top was sheeted, the capstrips added and the ailerons built. Here I made one change. Instead of using one servo for the ailerons, I mounted one in each wing panel. This was a personal preference.



The O.S. .46FX with a Slimline muffler results in a very neat engine compartment.*



Aileron servos are mounted on a plate that serves as an access panel. This makes for a clean installation.

FUSELAGE

The Extra fuselage is built using interlocking, die-cut parts that self-align during construction, so it's important to follow the instructions closely. The fuse sides are die-cut from one piece of lite-ply. After I assembled the various sub-assemblies (being sure to make a left and a right side), I followed the instructions and assembled the parts using tape, rubber bands and clamps, but no glue. This allows you to align everything with the plans. This may seem a little awkward at first, but it works very well. The gluing sequence is then followed. I added some ½-inch triangular stock to the landing gear area for extra strength. I then aligned and mounted the wing to the fuselage. The belly pan is now built on the bottom of the wing,

This plane makes fantastic two-wheel landings. With a little practice, you can hold the tail off the ground until almost all the speed has been bled off.

FLIGHT PERFORMANCE

After a three-week wait, we finally got a "warm" day to do the flight testing. Gerry Yarrish and Larry Marshall were on hand to assist with the evaluation. The ads say, "Accept NO Limitations"; we were going to put this statement to the test.

• Takeoff and landing

The Extra handles well during taxiing with no tendency to nose over. Taxiing is more challenging in windy conditions as the plane has a fair amount of side area and will weathervane into the wind. To prevent a nose-over during the takeoff roll, slowly advance the throttle and hold some up-elevator. The tail will come up quickly; release some backpressure, and hold the plane straight until flying speed is reached. A little tug of up-elevator and the Extra is away. Three clicks of down-elevator and two of right aileron had the Extra flying straight and level. The O.S.* .46FX has plenty of power, and aerobatics can be performed as soon as it's airborne (on the deck).



The plane is very clean, and when you reduce power, it takes a little longer to slow down than most planes. For the first few flights, start your approach farther out until you get the feel for slowing the plane down. A good, low, reliable idle certainly helps here. With practice, you'll find the proper throttle setting to maintain during approach. This plane makes fantastic two-wheel landings. With a little practice, you can hold the tail off the ground until almost all the speed has been bled off.

• Low-speed performance

At low speeds, control authority is good. During stall tests, the plane would get to a high AoA before stalling. When it did, the stall was very gentle, with a slight break to the left every time. Add power and level the wing, and recovery is complete. Low-speed aerobatics are also possible; rolls and snap rolls were no problem.

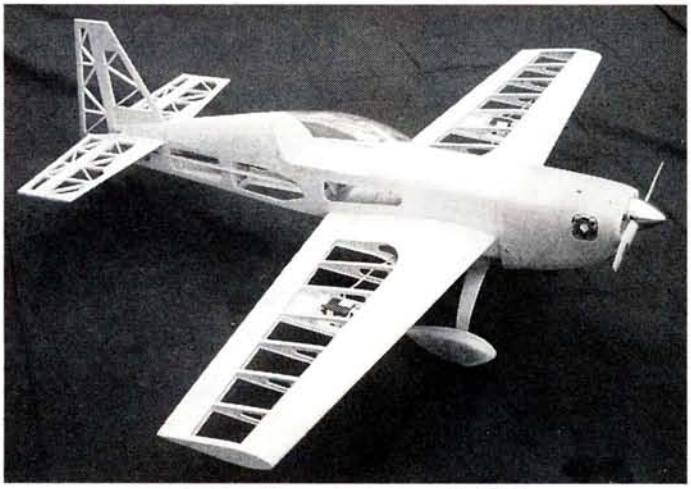
• High-speed performance

The Extra handles very well at high speeds. Control response is very positive to inputs. The recommended high-rate throws are right on for aerobatics, and the low rates make for gentle flying. I didn't notice any instability in high-speed maneuvers, and no pitch-trim changes are needed to transition from high to low speeds.

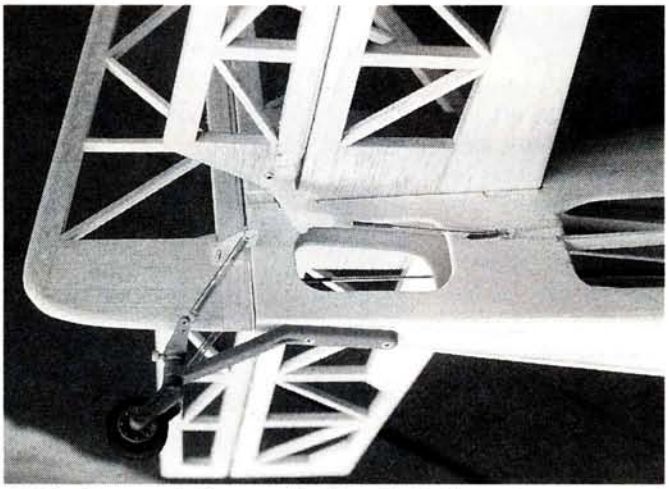
• Aerobatics

This is what the Extra was designed for, and this model is highly aerobatic and smooth. The plane flies very "neutral" and will do any maneuver in the book. Rolls are very axial, snaps are fast and stop on a dime. The plane holds inverted with little effort and will Lomcevak nicely, and it does knife-edge easily. I let one of our club's better pilots take the controls, and he proceeded to do a knife-edge circle around the field!

The Great Planes Extra 300S is a great flying plane. If you can fly an Ultra Sport, you can fly this aerobatic champion. Accept no limitations!



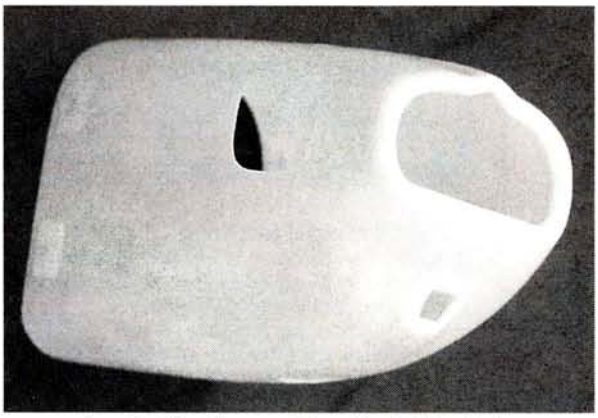
It's almost too pretty to cover, isn't it?



Tail feathers are built-up construction. For better scale appearance, I used a Klett tailwheel.

fuselage bottom sheeting is added, and the belly pan and the bottom of the fuselage are sanded to blend everything together. The top front decking is added and shaped. The stab and fin are then glued into place and the turtle deck built around them.

Engine and cowl installation are a snap. The procedure outlined in the instructions for making the cowl cutouts works well. Because this aircraft will be flown extensively, I opted for a fiberglass cowl and wheel pants from Stan's Fiber Tech*. The cowl is a one-piece unit (no seams), and it has no pinholes. If you use the two-piece ABS cowl and wheel pants, they're easy to assemble and fit the model well.



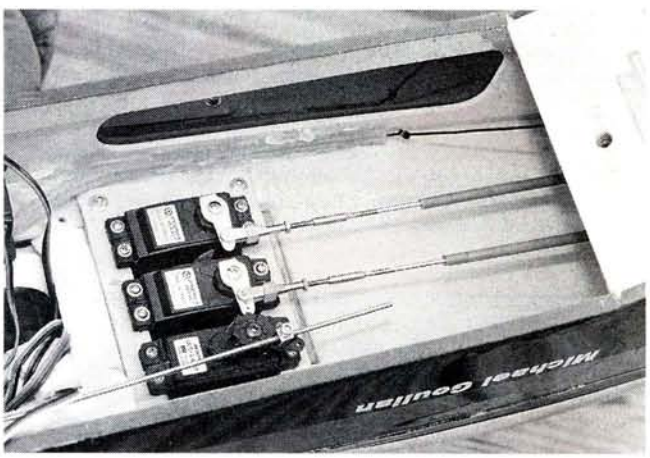
I used a fiberglass cowl from Stan's Fiber Tech.

COVERING AND FINISHING

Prior to covering, I final-sanded the model. For covering, I used Top Flite* MonoKote Insignia Blue, Dark Red and Metallic Gold. The cowl, landing gear and wheel pants were painted using matching Top Flite Lustrekote paints. The four-color graphics for my paint scheme were made from sketches and a few pictures of the original by Chuck French of Ward Graphics*. He specializes in projects such as this and can duplicate these and almost any other hard-to-find custom graphics in vinyl or spray mask.

FINAL ASSEMBLY

Hinge the control surfaces, and install the landing gear, wheels, wheel pants and tailwheel assembly. Dress up the cockpit and add the canopy. Install the engine, cowl, prop and spinner. Complete your radio installation by mounting your servos, receiver and battery. Instead of gluing in the servo tray, I screwed mine down so I could adjust the CG by moving the tray forward or back. I did a quick CG check with everything in place and moved the servo tray back about 1¼ inches to set the CG in the middle of the range. Pushrods were then made. I then set up the control throws. Follow the recommended throws for all controls, *especially elevator*! Don't be concerned that the listed throws are not enough; they are plenty. Final balance was completed by moving the receiver battery in front of former F2B. No dead weight was needed for balance.



There's plenty of room inside the Extra for radio gear.

SUMMARY

The Great Planes Extra 300S is an excellent kit and a good value for the money. The model is easy and quick to build, has clear instructions, looks great on the ground and in the air and has all the attributes of a winner. The GP Extra 300S would make a great choice for the MINI-MAC events starting up around the country, or for the sport flyer who wants that little "extra" to put on his own airshow.

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.*

About the author

Rick Bell says that he has been involved in modeling as long as he can remember, and his main interests lie in helicopters and aerobatic fixed-wing planes. Rick flies with the Central Connecticut R/C'ers and has been sharing his enthusiasm for modeling with his 13-year-old daughter Rachel, who recently won first place in the Junior Division at the WRAM Show in West-chester, NY.



A deadly view. Twin-scale .303-caliber Vickers machine guns draw a bead on the photographer. Notice the finely detailed dummy Bentley radial engine. A Quadra* 50 lurks behind.

The Snipe

Sopwith's successor to the Camel

by GERRY YARRISH

ONE OF THE MOST famous fighters of WW I was the British Sopwith Camel, and it was regarded as one of the best fighters of its time. As the War continued, however, the Sopwith Aviation Co. knew all too well that fighter development would have to continue. The much valued Sopwith Camel's days were numbered. Sopwith decided to use the same powerful and reliable Bentley radial engine used in later-model Camels to power the new aircraft. The first Sopwith Snipe flew in the summer of 1917, and the prototype was quickly followed by five preproduction aircraft.

The first two Snipes had very strong Camel family traits, with distinctive Camel-like fins and rudders. By the time the Snipe went to the front lines, many design changes had taken place. The wingspan was increased by over 4 feet, the tail surfaces were increased in area to compensate for the torque of the 230hp Bentley engine and standard armament was finalized to a pair of forward-firing .303-caliber Vickers machine guns. For its time, the Snipe was a large, powerful and robust frontline single-seat fighter.

TOM'S SNIPE

Well-known scale modeler Tom Polapink of Centereach, NY, has been building finely detailed and accurate WW I scale models for most of his R/C modeling career. A regular at the Top Gun scale invitational and winner of many scale competitions, Tom has been perfecting his miniature versions of the Sopwith Snipe. Having built several before, his newest model, shown here at the '96 Top Gun meet, is built to a scale of slightly less than 25 percent. The model is scratch-designed and built, and it took Tom seven months to complete.

The model flies on scale, under-cambered wings and practically every fitting, turnbuckle, nut, bolt, washer and screw is faithfully



Tom Polapink's magnificent Sopwith Snipe sits quietly on the 1996 Top Gun flightline.

SPECIFICATIONS

Name: Sopwith Snipe

Type: WW I single-seat fighter

Wingspan: 80 in.

Weight: 27 lb.

Engine: Quadra 50

Radio: Airtronics Championship Series

Covering: SuperShrink Coverite

Paint: Sig Dope and Krylon spray paint

Time to build: 7 months

Construction: balsa, plywood and spruce

Comments: Tom's Sopwith Snipe is completely scratch-designed and built and is typical of his scale-model building ability. Tom was a competitor at the 1996 Top Gun scale invitational and placed 6th with his Snipe at the 1995 Scale Masters, where he also received the Best Military award.

reproduced. Some of the fittings and turnbuckles were made from modified Proctor* offerings, while the majority were scratch-built in Tom's workshop. The model sits on modified Williams Brothers* vintage wheels. The beautifully executed dummy Bentley radial engine is a perfect backdrop for a modified Proctor Nieuport 28 propeller used for static display. Tom used SuperShrink Coverite*, and the model was painted with custom mixed Sig* dope. The markings were applied using Krylon spray paint.

The markings on Tom's magnificent Snipe are representative of an early production aircraft typified by the unique shape of the fin and rudder. The aircraft registration E8057 identifies the Snipe as being assigned to RAF Squadron no. 70. Tom found documentation that the Snipe was, in some cases, outfitted with a bomb rack mounted behind the landing gear and carrying four Cooper bombs. Tom chose to use this feature as a scale function in competition and reproduced the bombs and rack in fine detail.



The distinctive shape of the fin and rudder shows that this is an early production version of the Snipe. Notice the scale bracing and control cables.

The consummate R/C scale model artisan, Tom embraces the history of early aviation with a passion, and the successor of the Sopwith Camel could not be more well-represented. Tom's Snipe is a true masterpiece.

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.*



As a scale function, Tom included this highly detailed bomb rack complete with four scale Cooper bombs.

MODEL AIRPLANE NEWS
HOW TO

THE HISTORY of WW I color schemes can and does fill volumes. This article will try to shed some light on one small segment of this broad topic.

WW I Lozenge Camouflage

by GUY FAWCETT

Easy iron-on covering

ORIGIN OF LOZENGE FABRIC

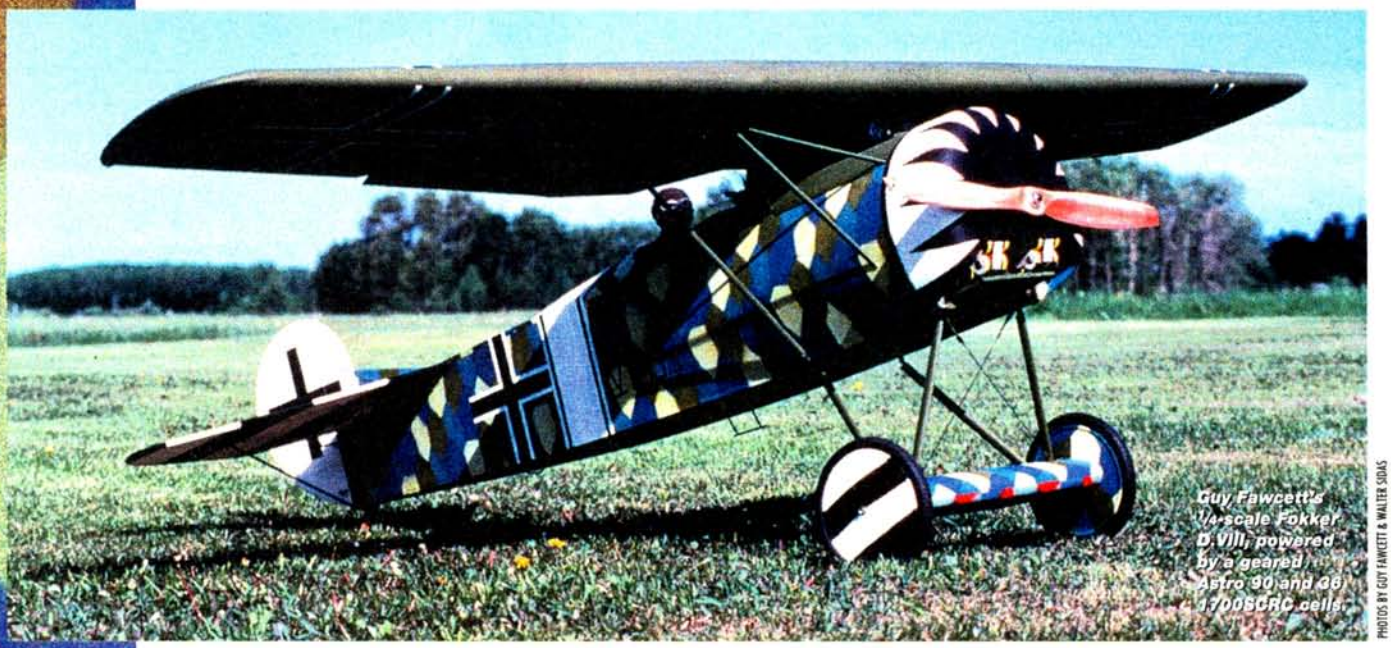
At the beginning of WW I, aircraft were covered in linen and protected with clear dope. The fabric in use during this period resulted in aircraft that appeared anywhere from white to a light beige in color. Some German cloth was available in a basic green or gray. As the War advanced, both sides began using various types of colored pigment. This dope was used both to prevent ultraviolet destruction of the fabric and provide some camouflage effect.

However, beginning in April of 1917, German aircraft manufacturers were instructed to begin applying a distinctive and unique factory-dyed camouflage fabric. Preprinted fabric added little weight and had the additional benefit of a great savings in time and expense during application.

The theory behind lozenge camouflage had been discovered by artists at the turn of the century. They had shown that small points of color viewed from a distance merge. This optical illusion causes the dominant color of the background to enhance a similar color in the pattern of points. The mind interprets the background and the pattern as the same color, producing a chameleon-like effect.

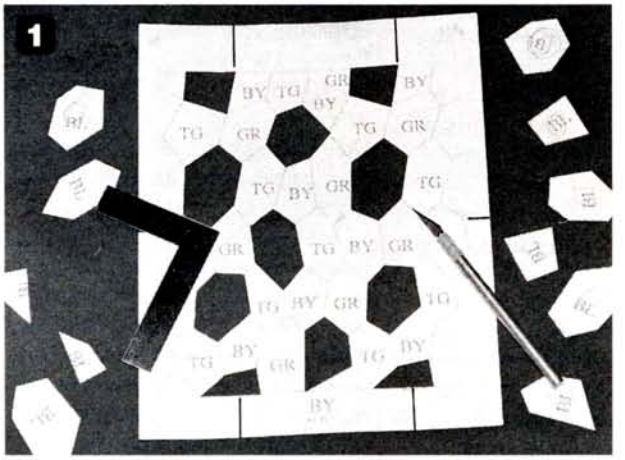
Engineers then designed a nearly perfect camouflage pattern to use this theory. Of course, by adding gaudy individual, unit and national insignia designed to attract attention, people very often negated any camouflage offered by the lozenge pattern (a good thing, or our models might disappear before our very eyes, most likely on final approach).

Preprinted lozenge fabric was shipped as bolts in standard dimensions. The common width for four-color fabrics was 4 feet 3¼ inches. Five-color fabrics came in bolts 4 feet, 6 inches wide. A point worth noting for modelers is that during the manu-

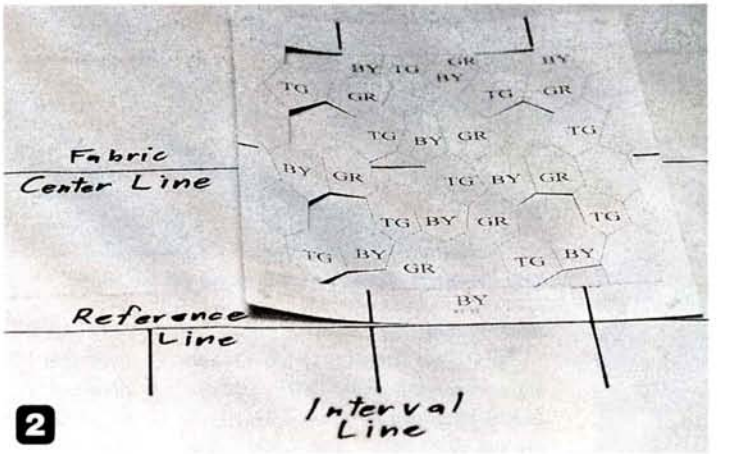


Guy Fawcett's ¼-scale Fokker D.VIII, powered by a geared Astro 90 and 66 4700SCRC cells.

PHOTOS BY GUY FAWCETT & WALTER SODAS



Here is how the template appears with all of one color cut out. Four of these are required.



Using the template, mark out all the reference lines.

facturing process, the printing bleeds through the fabric enough to give a faint pattern on the inner surface. That pattern would show up on the insides of cockpits where bare cloth was visible. This effect will determine which fabric material is chosen as a base.

Printed cloth was applied like any other fabric covering—stitched, doped and taped. Tapes used for lozenge fabric came in either light blue, light pink, or were simply made by tearing strips off the lozenge fabric.

The modeler should be aware that lozenge fabric was manufactured in a variety of patterns and color sets. Pattern types abounded. There existed a four-color upper daylight scheme, a five-color daylight scheme, night schemes and naval hex pattens. Some aircraft even had their own distinctive patterns. For each of the basic patterns there were two color groups—one group of darker colors for upper surfaces and another lighter group for the lower. The pattern used on a particular aircraft can only be revealed by extensive research into the prototype being modeled.

Besides the numerous schemes, the fabric itself could be applied in various directions or combinations of directions. Three known methods of wing coverage occurred: spanwise, chordwise and diagonal.

Spanwise application used a long strip, full-bolt width, attached from one wingtip across to the other. If the wing chord exceeded the width of fabric, the uncovered portion was again covered with another piece stretched spanwise, excess trimmed, and the two fabric panels were sewn together. Standard rib stitching and taping would follow.

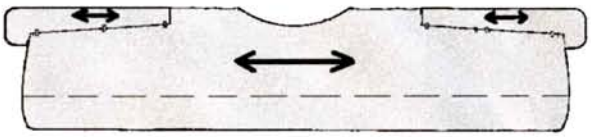


Figure 1. Spanwise covering with lozenge fabric. Arrows indicate pattern direction.

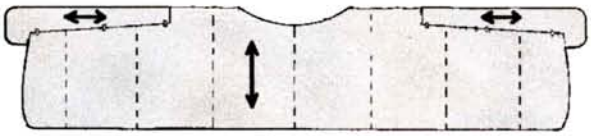


Figure 2. Chordwise covering with lozenge fabric. Arrows indicate pattern direction.

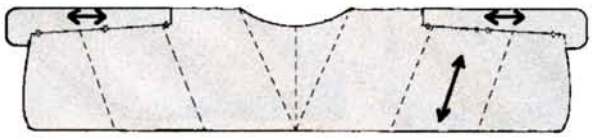


Figure 3. Diagonal covering with lozenge fabric. Arrows indicate pattern direction.

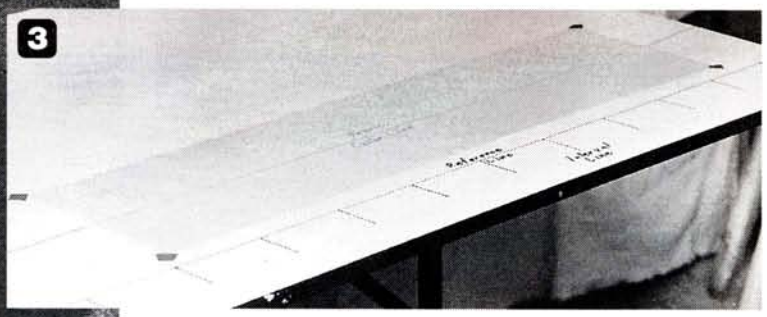
Chordwise application took several standard widths of fabric and applied them in parallel, perpendicular to the wing leading edge (along the ribs). Again, standard rib stitching and taping would follow.

Diagonal application was similar to chordwise, but the fabric was applied diagonally at 45 degrees to the chord, sometimes meeting symmetrically in the center.

Frequently, the ailerons were covered spanwise no matter what the orientation of the wing fabric. Fuselages invariably had the fabric applied along their length. Anytime the fabric was matched edge to edge, every effort was

PAINT TABLE

Colour	Template Code	Methuen#	FS#	Apple Barrel Paint	Americana
FUSELAGE TOP AND SIDE LOZENGE FABRIC					
Dull Blue	BL	21D4	15177	Military Blue	DA40 Williamsburg Blue
Deep Turquoise	TG	24E7/25E7	15193	Galaxy Blue	DA107 Teal Green
Olive Brown	BY	4D4/5D4	14255	Avocado	DA147 Antique Green
Pea Green	GR	29D5/30D5	24552	Leaf Green + Honey Suckle	DA56 Olive Green
FUSELAGE BOTTOM LOZENGE FABRIC					
Dull China Blue	BL	23D4	15107	Liberty Blue	DA40 Williamsburg Blue + some Black
Dull Gray Green	TG	26D4	24241	Sage Green	DA177 Green Mist
Brazen Yellow	BY	4C7-5C7	13637	Antique Gold	DA168 Golden Straw
Grayish Rose	GR	11B5	21158	Real Red + Light Gray	DA156 Antique Rose



With the fabric aligned on the surface, the fun begins.

made to align the pattern.

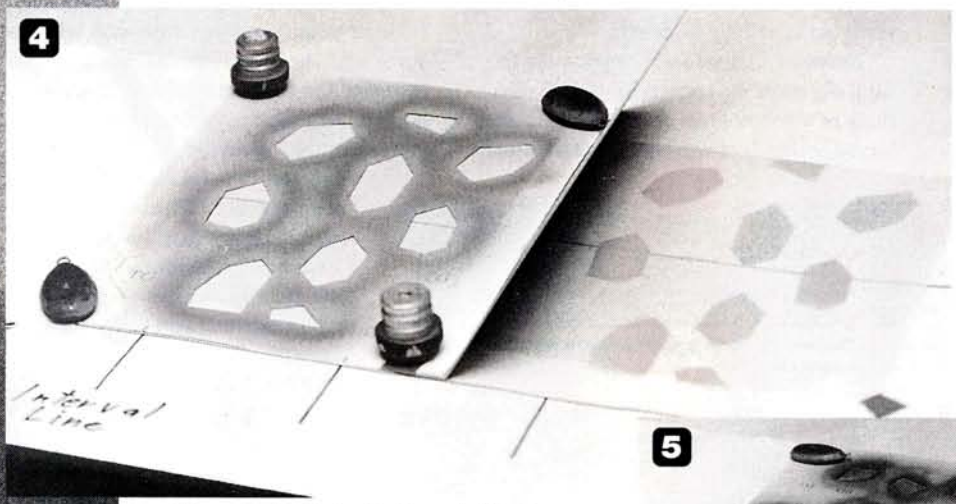
In all the drawings, the arrows show direction of the fabric, and the dotted lines denote sewn seams joining panels together. The panel seams on the four-color fabric would be 48 inches apart, and on five-color fabric, they would be 50 inches apart.

MODELING LOZENGE

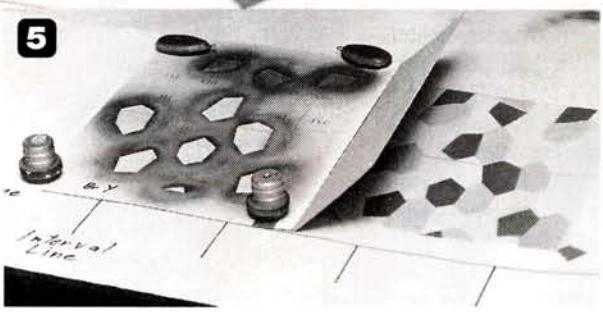
The crux of the problem for any modeler choosing to build a scale model of one of these fine machines is how to duplicate the lozenge color pattern. Any method of applying lozenge patterns that I had previously read about involved the arduous task of attempting to paint these colors onto an irregular, curved surface. Upon examination of many WW I German aircraft, it became apparent that the only way to duplicate the appearance effectively is to paint the fabric before applying the covering. Like many of today's modelers, the very thought of applying fabric that is not ironed on is daunting. For a brief time, Coverite* produced lozenge fabric commercially. Unfortunately, that material has long since passed into history like the prototype it copied.

So, to solve this problem, I needed a paint that would not be affected by the heat of application. Fortunately, just such paint exists for the craft world. Used for painting clothing, these paints display all the characteristics required to produce an iron-on fabric. I decided to use Apple Barrel and America brand paint simply because of the availability. Other brands with the same specifications are available, and color cross-reference charts exist to compare brands. These paints come in a myriad of colors. Best of all, they are non-toxic water-based acrylics, so the other members of your family will love the fact that there is no odor. Thinner and cleanup fluid is as close as the nearest tap.

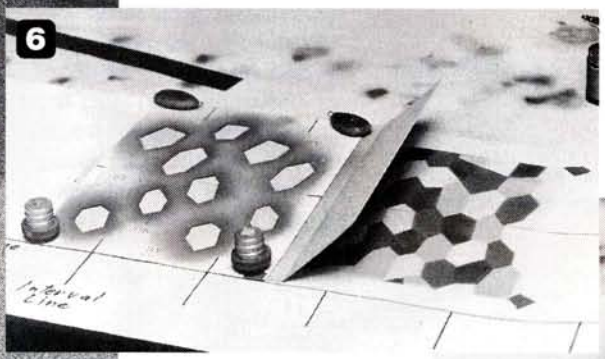
As I mentioned earlier, the base fabric should appear similar to the full-size fabric of the prototype. My application required the use of a neutral light-colored cloth as a base for the proper effect. I found Antique



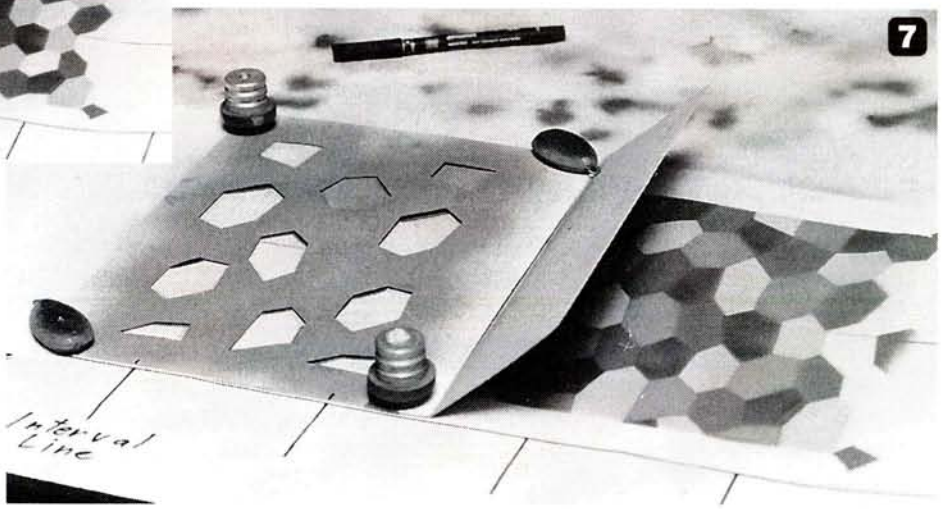
Above: the lightest color is applied first.



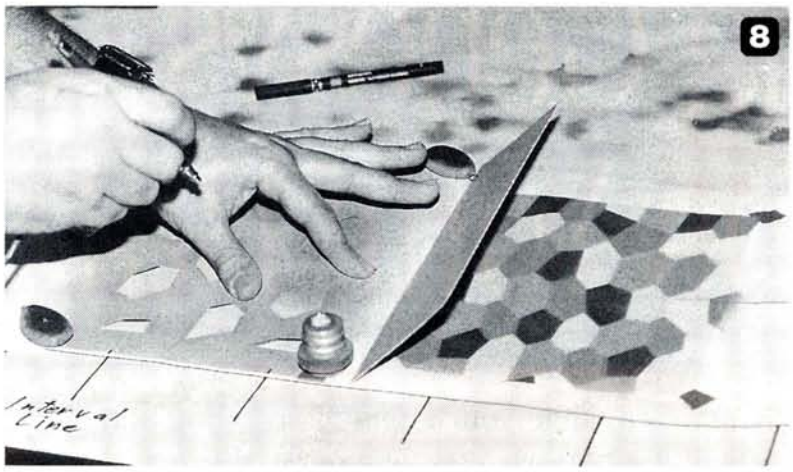
Left: proceeding to the second color, ensure that where the colors contact, there is a slight overlap.



Above: proceeding to the third color, ensure that where the colors contact, there is a slight overlap.



Right: proceeding to the final color, ensure that where the colors contact, there is a slight overlap.



Best results are achieved by pressing down on the mask; you ensure a clean edge to the lozenge.

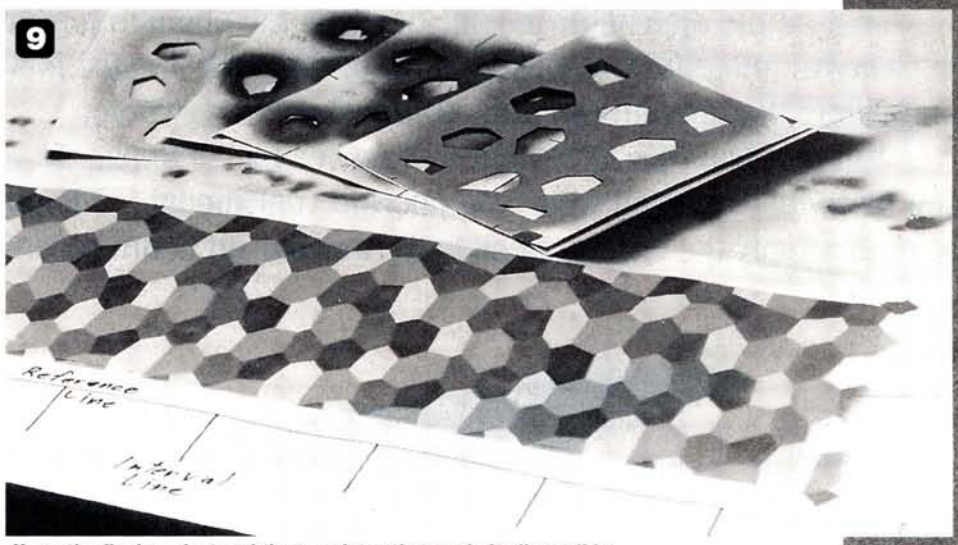
Super Coverite an excellent choice, but white would probably work equally well. Anybody wishing to experiment can use any other unpainted, heat-applied fabric.

Begin by cutting out a lozenge stencil pattern from lightweight bristol board; one template is required for each of the four colors. Cut the holes about 1/64 inch oversize to allow an overlap to adjacent colors. Add a raised edge about 2 inches high to contain any overspray.

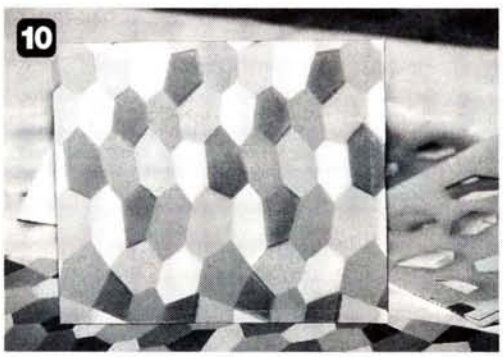
On a large, flat surface, draw a reference line, and then, using the template as a guide, draw a centerline for the pattern. Again, using the template, mark interval lines along the reference line.

Cut out panels of Super Coverite to fit the area of the airframe to be covered, and tape them to the prepared surface. Be sure to align the fabric so its center is down the centerline on the surface.

Take the template for one color (work from the lightest to the darkest), align the interval markings, and spray through it (several light mist coats using any decent airbrush). To ensure that the template does not move during painting, place 1-ounce weights in each corner. Press down around each opening on the template as you spray to ensure a hard edge to the color. Move the template along, and spray again until all of that color has been applied. Shooting every other interval on the first pass produces the best result by allowing the paint to dry before applying the intervening panels. The paint must be thinned at a ratio of one part paint to two parts water and up to one part windshield washer fluid (helps the paint wet out and dry faster). The addition of a heater blowing hot air across the fabric will also aid in speeding up the process. Repeat the process once for each of the four colors.



Here, the final product and the templates that made it all possible.



After being ironed onto the structure, the fabric is ready for markings and final fuelproofing.

Then take the pre-painted Coverite and cover the aircraft normally. Use only as much heat as is needed to activate the fabric glue.

Once covering is complete, you have the choice of cutting rib tapes from leftover scraps of lozenge fabric or from pink or blue Coverite. Then apply simulated stitches (yellow carpenter's glue seems to work best for this) across the tops of the ribs, and iron the rib tapes over these.

The final task for those flying glow-powered airplanes is to shoot an overall coat of fuelproofer. Perfect Paint* Clear is suitable, but anything else is an experiment, so try it out on leftover sections of painted fabric before you commit yourself.

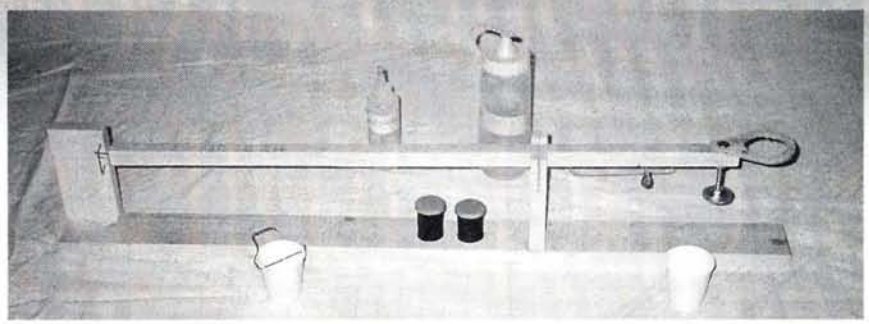
When clearcoating the plane, you should be aware that the finish applied to these old birds was at least a semi-gloss and actually varied according to the length of outdoor exposure. Factory fresh examples would be very glossy, and as they aged, the surface would gradually dull to a semi-gloss.

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.* ✚

About the author

Forty-two-year-old Guy Fawcett started flying rubber-powered models at the age of 10 and flew control line at 12 (ubiquitous Cox PT-19 ARF). Guy was 16 when he built a 1/6-scale Sig Cub, which lasted part of one flight, but it started a lifelong love affair, or obsession, others would say, with scale models. His big interests are WW I and electric power. He competes in scale contests when the opportunity presents itself and usually doesn't do too badly (even made it to the '91 Masters in Las Vegas). Guy currently resides in Devon, Alberta, with his lovely wife Jackie and two children, Michelle and Alex. At the moment, he is trying to get an electric and glider club off the ground, so to speak, in the Edmonton area.

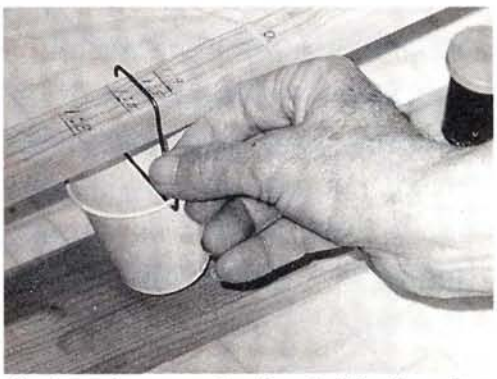
MODEL AIRPLANE NEWS
HOW TO



PHOTOS BY CHUCK ANDERSON

The balance is a single-cup system in which the balance is leveled with an empty resin cup in the holder and no weight on the zero position of the balance arm.

Mixing Epoxy Resin



The beam is measured and marked for the various resin/hardener ratios to be mixed.

by CHUCK ANDERSON

A simple balance to ease the task

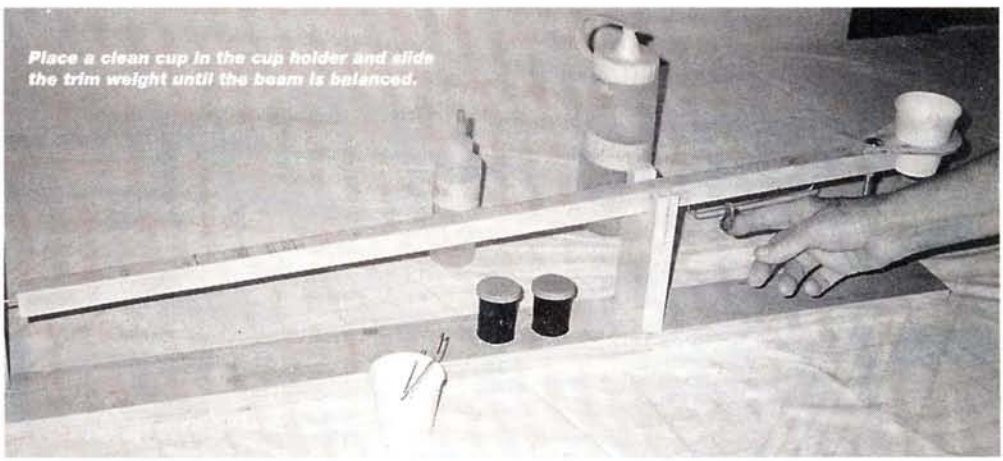
I DEVELOPED this balance about 15 years ago because, when I switched to epoxy resin for building fiberglass fuselages, I found that different products required different mixing ratios, and I needed a tool to generate the proper mixture of resin and hardener. This balance is easy to use, and I have found it to be at least as accurate as a lab-quality beam balance when mixing resin, especially when mixing very small amounts.

This balance was designed around the plastic cups sold for use with standard 3-ounce bathroom dispensers. I find this to be a convenient size since I seldom mix more than 2 ounces of resin at a time. Other cups may be used by changing the resin-cup holder as long as the dimension from the center of the cup to the pivot is not changed. Materials can be purchased at any home building supply store for less than $5. If you happen to have a well-stocked scrap box, you might even have enough scrap to build the balance. Only the balance beam weight cup, pivot and resin cup locations shown in the drawing are critical. Other dimensions may be changed to fit available materials. The balance can be built smaller; the dimensions chosen were selected to maximize accuracy and simplify calculations for the weight cup locations for various resin-to-hardener ratios.

CONSTRUCTION

Begin by cutting a 36-inch-long base from 1x3-inch white wood. (Tip: check the wood in the "white wood" bin carefully. I have found good, straight-grained spruce in the white wood bin.) Also cut a 5-inch balance pivot support and a 5.5-inch pointer scale from the same wood. Cut a slot for the balance beam in the pivot support. Slot the pivot support for the utility blade using a razor saw or hacksaw blade. An easy way to be sure that the slot is parallel to the 3-inch face is to lay the pivot block on a flat surface and use $\frac{3}{8}$-inch strips to guide the saw blade. Attach the pivot support and pointer guide to the base at the correct locations using nails and carpenter's glue.

Cut a 30-inch length of 1-inch-square wood for the balance beam. Lay out the cup holder on $\frac{1}{8}$-inch plywood. Draw the centerline for the holes, and make sure that the lines cross the rim. Carefully cut out the hole for the resin cup, and make sure that the hole is centered. Errors in the location of the hole for the resin cup will reduce the balance



Place a clean cup in the cup holder and slide the trim weight until the beam is balanced.

accuracy. When you're satisfied with the fit and location of the resin-cup hole, finish cutting out the cup holder, and glue it to one end of the balance beam using carpenter's glue.

When the glue has set, tape a scrap of cardboard over the bottom of the cup holder, and re-draw the centerline of the hole. Measure exactly 10 inches from the center of the cup holder, and carefully draw a line perpendicular to the beam. Use a square to transfer the location to the bottom of the beam, and cut a shallow notch for the pivot. The notch must be exactly 10 inches from the center of the resin cup and perpendicular to the beam, so take your time. Now lay out the weight cup positions for epoxy ratios of 5 to 1, 2.22 to 1 and 1 to 1 as shown in the plans.

The balance is now marked for the three most commonly used epoxies. If you need another ratio, the distance from the pivot point to the weight cup location for any ratio is simply the parts per 100 of hardener divided by 10 plus 10.

Distance = Parts per 100/10 + 10

The calculation for E-Z Lam* is therefore

Distance = 45/10 + 10 = 14.5 inches

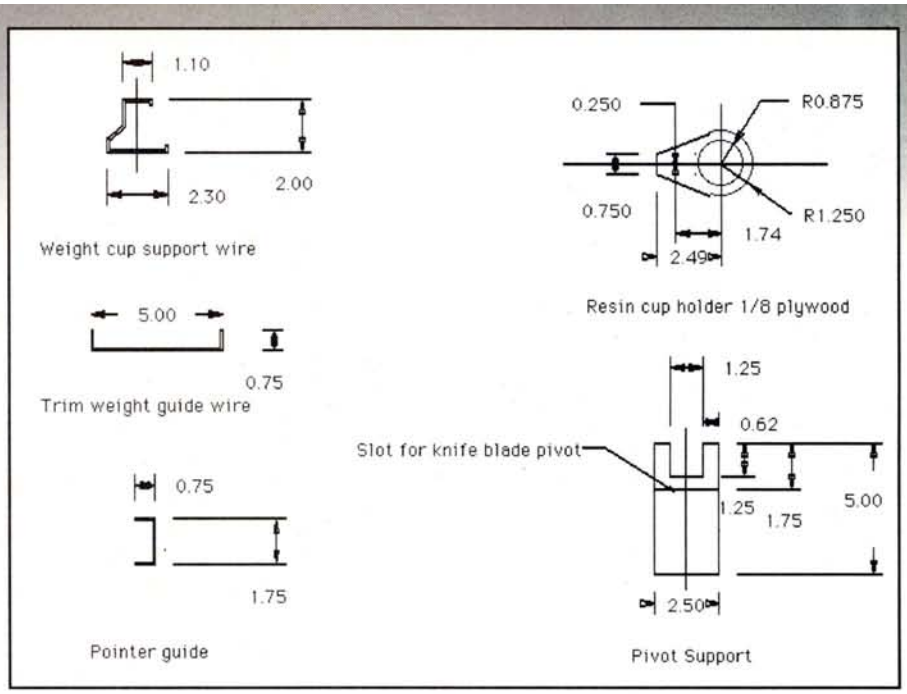
The reason for selecting 10 inches for the distance from the resin cup to the pivot is to simplify calculation of the distance measurements for any ratio.

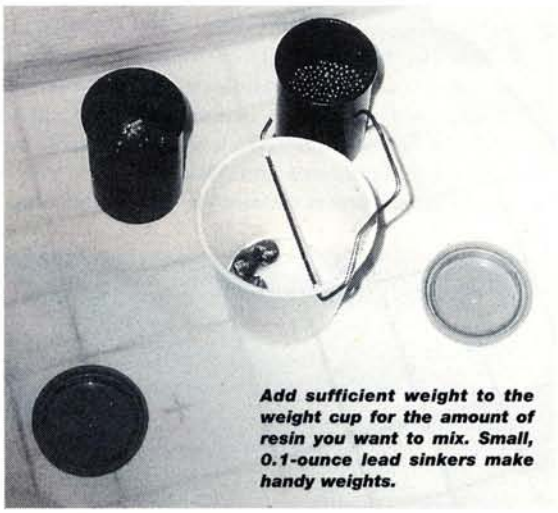
When you calculate the distance, be sure to use parts per 100 when measured by weight. For example, the ratio for E-Z Lam is 45 parts per 100 when measured by weight or 50 parts per 100 when measured by volume. West Systems* epoxy is 20 parts per 100 (5 to 1) whether measured by weight or volume.

Drill a 1/4-inch hole and install a 3-inch-long carriage bolt for the counterweight. The trim weight slide wire, weight cup holder and beam pointer stop are bent up from 1/16-inch soft iron wire. Drill a slightly undersize pilot hole for the trim weight slide wire. Slide a 1-ounce fishing sinker on the slide wire, and press into place. Drive a small finishing nail or scrap of wire into the end of the balance arm to serve as a pointer. Mark the location of the pointer on the pointer scale, and install the wire pointer guide. Punch holes on each side of a 3-ounce cup, and slide it on the wire hanger.

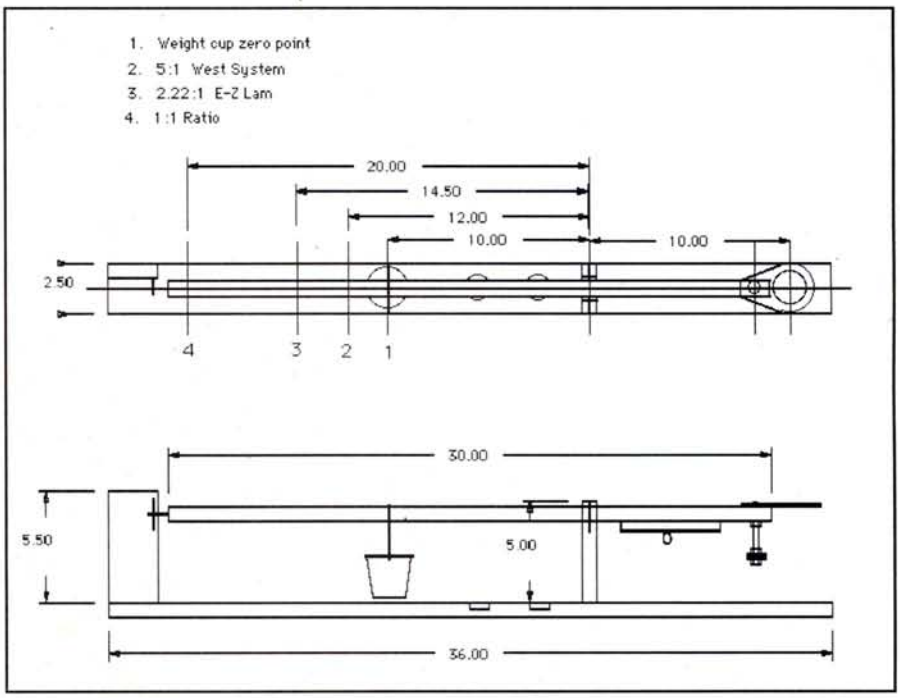
Almost anything can be used as weights with this balance; I have found that 0.1-ounce lead sinkers are the easiest to use, while lead shot is useful if fine adjustments are needed. I keep these weights in 35mm film canisters. If you decide to use these, then drill two 1.25-inch-diameter holes halfway through the base between the pivot support and the zero weight location.

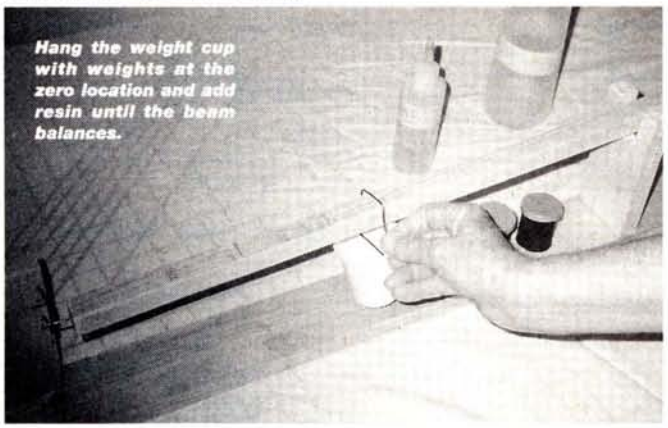
This is the time to paint the balance if you desire. Painting the balance will give a more professional look as well as make cleanup easier. I didn't bother with a finish and used the original balance for over 15 years. I did wipe the balance with acetone occasionally to





Add sufficient weight to the weight cup for the amount of resin you want to mix. Small, 0.1-ounce lead sinkers make handy weights.





Hang the weight cup with weights at the zero location and add resin until the beam balances.

remove uncured resin and had no problems.

The pivot is a blade from a utility knife epoxied into the slot on top of the pivot support. Be sure that the top edge of the blade is parallel with the base of the support. If all dimensions are accurate, then the dimensions shown in the drawing will be sufficient. Otherwise, you have to correct it by calibration. The balance adjustment weight compensates for slight variations in the weight of the resin cup and is a 1-ounce lead fishing sinker. Set the balance on a level surface, and install the balance arm. Slide the trim weight to the center of the wire, and add nuts and washers to the counterweight bolt until the beam balances with an empty 3-ounce paper cup in the resin-cup holder, no weight cup installed and the adjust weight centered. Any material can be used for the weight; large, flat washers clamped between two nuts are the easiest to handle. My original balance used a Cox glow head wrench left over from long gone Cox engines. (I used to fly free flight, too.)

CALIBRATION

If the dimensions of the balance arm are accurate, then the dimensions shown should be good enough for mixing resin. If errors are found in any of the dimensions, then the scale will have to be corrected. In any event, a calibration check should be performed to verify the scales.

You need a roll of new pennies to calibrate the balance. Remove the weight cup, install an empty 3-ounce cup in the resin-cup holder, and adjust the trim weight until the pointer on the balance beam is aligned with the mark on the pointer scale. Place 20 pennies in the resin cup, and make sure that the pennies are evenly distributed in the bottom of the cup. Hang the weight cup on the zero line of the balance beam, and add water to the weight cup until the beam again balances. Then add four pennies to the resin cup, and move the weight cup until the beam balances. The cup should be on the 5:1 line. If the location of the weight cup is off more than 1/32 inch, erase the 5:1 mark and redraw it at the weight cup location. This is the location for West Systems epoxy. Add five more pennies to the epoxy cup, and repeat the check for 2.22:1 location. This is the location for E-Z Lam epoxy. Now add 11 pennies to the epoxy cup, and repeat the check for the 1:1 location.

MIXING RESIN

Measuring resin could be done just like the calibration; however, it is easier to hang the desired weight at the zero location and then add resin until the beam is balanced. Almost anything can be used for weights; 0.1-ounce split lead sinkers make very good weights and are easy to use. The weight cup and wire also should weigh about 0.1 ounce, so if you need 1 ounce of resin, all you have to do is place nine sinkers in the weight cup.

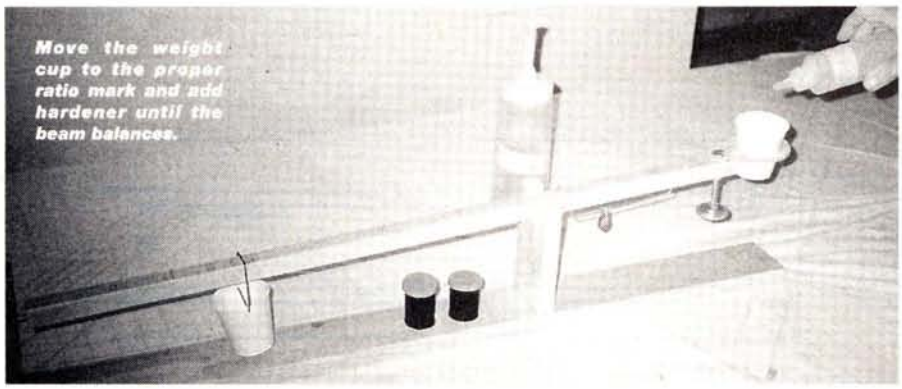
Place a clean cup in the resin-cup holder, and slide the trim weight until the beam is balanced. Then hang the weight cup with weights on the balance beam at the zero location. Now carefully add resin until the beam balances. A squeeze bottle like those used by E-Z Lam uses makes it easier to control the amount of resin and hardener being added to the resin cup. Relaxing the pressure on the bottle stops the flow of resin or hardener instantly. If an excessive amount of resin is added to the cup, add weight to the weight cup until the beam balances. Lead shot is good for making fine adjustments to the weight in the cup but shouldn't be needed if you are careful.

Move the weight pan to the desired ratio point, and carefully add hardener to the resin cup until the beam is balanced. Be especially careful when you add hardener since it is not possible to accurately add the correct amount of resin if you get too much hardener.

I have been using this type of balance for mixing epoxy resins for over 15 years and have found that it gives me the most accurate mixes, and this makes the job of mixing epoxies much more rewarding.



Using squeeze bottles makes dispensing resin easy.



Move the weight cup to the proper ratio mark and add hardener until the beam balances.

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.*

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

Skytech Aviation

SUPERSTAR

This scale aerobat shines!

by BILL STEFFES

THE FULL-SIZE SUPERSTAR traces its origins to the same aircraft as its more famous sister, the Laser. Both started with the basic Stephens Akro design. Henry Haigh, a longtime U.S. aerobatics team member, increased the Akro's tail areas and added more headroom, and the result—the Superstar—is a very competitive, world-class aerobatics machine. With its flowing lines, the Superstar is one of the most beautiful airplanes in existence, and it's a smooth and graceful competitor. When Skytech Aviation* scaled the aircraft down to model size, it really started to shine. Its areas and moments are ideal for model aerobatics.

When the kit arrived, I was amazed at the size of the box and thought I would have trouble getting it down into my shop. When you open the box, you see that this is truly an ARC (almost ready to cover) kit. It comes with a fiberglass fuselage, cowl and wheel pants; sheeted foam wings and tail group; an aluminum wing tube and landing gear; and a small bag of hinges, horns, some balsa blocks, etc. To complete the kit, I had to buy only a Du-Bro* fuel tank, wheels, pushrods and clevises; a Tru-Turn* 3-inch spinner; Pacer Technology's* Zap 5-minute epoxy; and covering. The instruction book is simple to follow and has an added three-page photo layout.



PHOTOS BY BILL STEFFES & GERRY YARNISH

FUSELAGE

There are no rear bulkheads to glue in because a piece of balsa and carbon fiber has already been laminated inside the fuselage. The balsa reduces harmonic resonance; the carbon fiber provides torsional strength. For added strength, a honeycomb material has been laminated on either side of the fuselage between the firewall and the wing-tube openings.



Bill primes up the Q-52 for another flight.

Start by sanding the molding lines off the fuselage and cowl. My fuselage was joined quite well and required little sanding. Then roughen up the inside per the instructions. Stop and wash the fuselage and cowl with warm water and soap. This step is important so that later on, when you prime and paint, you won't get any "fish eyes" from the release agent.

I used Robart* Rough'n'Tough carbide cutters to open up the wing tube and incidence dowel openings. Take your time cutting these holes; the tube must fit perfectly so that your wings will butt against the fuselage evenly.

Epoxy in the supplied plywood parts per the instructions with Zap 5-minute epoxy. The kit provides 1/8-inch-thick plywood for the firewall; I substituted 1/4-inch aircraft ply.

WINGS

Remove the foam-cores from their cradles, and find the 1/2x3x16-inch balsa block supplied in the parts kit. This will be used for making all the tip pieces. Since the ailerons have already been cut out and the leading edge (LE) has been installed, temporarily tape the ailerons into place. Place the balsa block on the wingtip, trace the outline, and cut it out. Make two—one for each wingtip. Now epoxy the tips onto the wingtips, and sand the LEs. The next step is to mark a left and right panel since they are fully symmetrical. Then cut out the servo openings, indicated by the "X" marked on the wing panels. Use a hobby knife to cut a small hole at the "X." Remove the wing-skin balsa in that area. Refer to the instructions and drawings for servo installation. Drill the root rib for the supplied alignment dowel, and epoxy that into the wing. Cut the aileron loose, and install the hinges. The kit comes with Sig hinges, but I substituted Robart large HingePoints because of their easy installation and fail-proof design. Your wing is now ready for final sanding and covering.

TAIL SURFACES

As with the wing, trace the tail outlines onto the balsa blocks for the horizontal stabilizer and elevator tip blocks. Again, make two of each. You'll notice that the elevator has to be cut at an angle so the rudder will be able to get full deflection. To achieve this, measure out approximately 1 5/8 inches from the inside trailing edge to the tip. Now take the 1x1-inch block, and cut it to fit in the inside edge of the elevator. Make one for the left and one for the right. Take the balsa tip blocks you cut earlier, and epoxy them into place. Don't forget to epoxy in the elevator horn mounts. Sand the LE to shape, and you are now ready to hinge. Again, I used the Robart large HingePoints. After final-sanding, you're ready for covering. I

SPECIFICATIONS

Model: Superstar

Type: scale mid-wing aerobat

Distributed by: North American Power R/C

Manufacturer: Skytech Aviation

Wingspan: 87 1/2 in.

Wing area: 1,073.25 sq. in.

Weight: 16 to 17 lb.

Wing loading: 36.51 oz. per sq. ft.

Length: 65 3/4 in.

Engine req'd: 52cc

Engine used: Quadra Q-52XL w/Intellispark

Radio req'd: 4-channel (elevator, rudder, aileron and throttle)

Radio used: Futaba 6VA

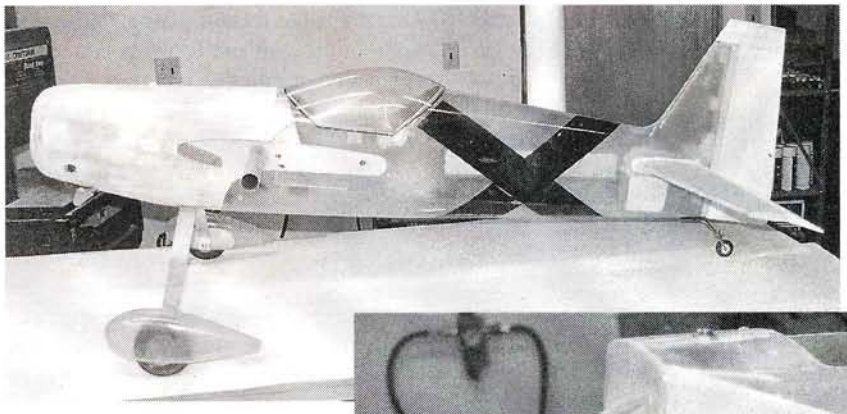
Price: $525

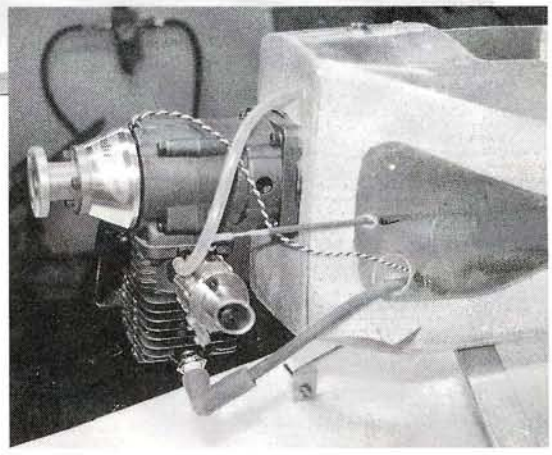
Features: fiberglass, foam and plywood construction.

Comments: great value for the money, high quality and ease of construction. The Superstar is available in both a 30 percent and a 33 percent scale version.

Hits
- Pinhole-free fiberglass fuselage, cowl and wheel pants.
- Fast to build.
- Great flight performance.

Misses
- Weak aluminum landing gear. [*Editors' note: now replaced with thicker gear.*]
- Canopy is hazy.





Above: The completed fuselage ready for wing installation.

Right: The Superstar prior to painting. The Quadra Q-52XL engine installation is as simple as it gets. The fuselage is reinforced in areas requiring more strength.

FLIGHT PERFORMANCE

• Takeoff and landing

The first takeoff with the Superstar required a light touch of right rudder for it to track down the runway nice and straight. Then it became a little hair-raising when, about 50 feet in the air, the engine started to bog down. A little bit of down-elevator was used to keep the plane level and prevent it from stalling. The engine then cleared itself and came to full rpm. The plane tracked straight and true and required no trim adjustments. When landing, keep the nose down and some power on until just before flare. Then back off the power completely.

• High-speed performance

The Superstar flies very fast and is very agile. No trim adjustments are needed between all-out and mid-range.

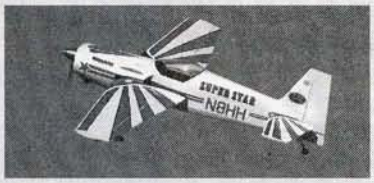
• Low-speed performance

The plane can be flown at mid-range or even lower with no tendency to fall off either wingtip. Stalls are straightforward and very predictable. Go to full throttle, and you can climb straight up.

• Aerobatics

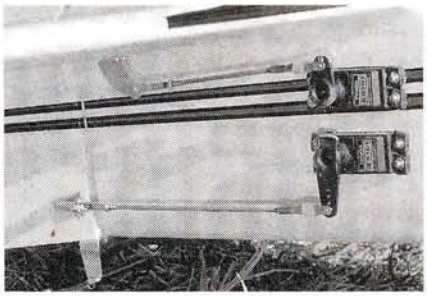
This plane can be a real hot-rod. When you release the inputs, it's like putting the brakes on when coming out of a maneuver. Snap rolls are crisp, stall turns are predictable, knife-edge flight is authoritative, and no down-elevator is required for inverted flight.

The Quadra Q-52XL is more than enough engine to keep this plane boring holes in the sky.

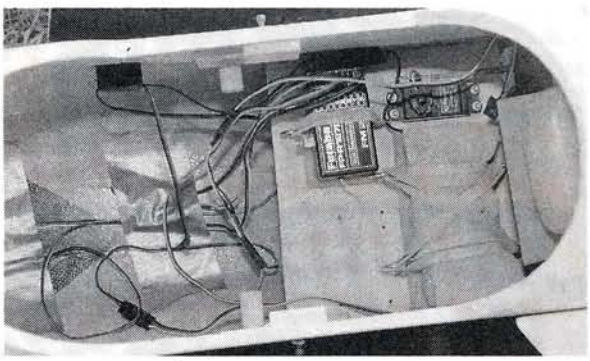


opted to fiberglass the horizontal stabilizer with 3/4-ounce cloth and Zap's finishing resin instead of covering it with film. Because the fuselage is fiberglass, this provides a much nicer look to the finished model.

Follow the instructions to size the rudder. I removed approximately 5/8 inch from the top of the rudder and epoxied two pieces of 1-inch balsa to the top. I capped the bottom with 1/2-inch balsa. Then I taped the rudder to the fuselage and sanded it to final shape. After this has been com-pleted, locate the position of the rudder-horn mounts on the drawing, and proceed as with the elevators. Do your final-sanding, and the rudder is ready for covering.



Rudder and elevator servos are installed in the tail just under the LE of the stab. I used Robart ball-link horns and 4-40 pushrods for a slop-free installation.



Looking inside the fuse through the cockpit opening, you see the large amount of space available for radio installation. I installed a plywood plate to support the throttle servo, receiver and battery pack. The fuel tank is visible to the right.

FINAL ASSEMBLY AND FINISHING

It is now time to install that powerplant. I used a North American Power R/C Inc.* Quadra Q-52XL with Intellispark. Install the wing tube, and set the fuselage at zero degrees incidence to the engine thrust line. Slide the wing panels onto the tube, and make sure they are at zero degrees. If not, relieve the alignment dowel opening, and make a plywood ring out of 1/8-inch aircraft ply, then drill to the size of the dowel. Slide this over the dowel, set your wing at zero degrees, and epoxy the ring into place. Do the same for the other wing panel. This step is important because it will affect the way the plane flies.

Now install the horizontal stabilizer. Remove the fiberglass in the fuselage area where the stab will be placed. Again, I used the carbide cutters to make this easier. Slide in the stab and epoxy it into place, making sure that it also is at zero degrees.

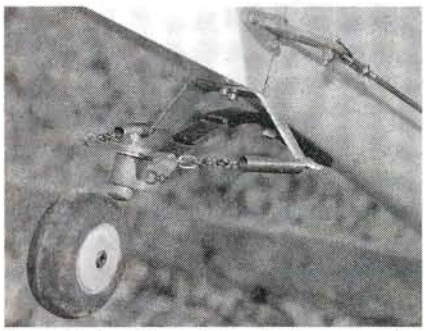
I used a Futaba* 6-channel radio and 90 oz.-in. high-torque servos—one on each aileron, one on each elevator half and two for the rudder. I opted to use these servos because this plane will be quite aerobatic.

According to the instructions, the CG is to be placed 5 1/2 inches behind the LE. I balanced my plane on the LE of the wing tube; this turned out to be a good starting point to test-fly the plane. You can always adjust the CG later to suit your flying skills.

The wings, elevators and rudders were finished using Great Planes* 21st Century white film covering. The fuselage, horizontal stab, fin and wheel pants were primed and painted with 21st Century paint. Model Graphics* supplied exceptionally well-done red, black and gold decals for the Superstar.

CONCLUSION

It was truly a treat for me to be able to have an entire scale airplane ready to fly in less than 40 hours. I haven't found another model that flies as smoothly and as effortlessly as the Superstar, and its landings have to be seen to be believed. It floats in without the mushing associated with other high-performance aircraft. This is the only unlimited aerobatics machine I've seen that's capable of slowing down to walking speed without tip-stalling. So if you want to show up at your field with something different and turn some heads, this is the airplane.



The tailwheel I used for the Superstar is a Scale Aviation unit from Cirrus Ventures*. The unit is a 1/4-scale TA 1000 series assembly, and it comes complete with springs and pull chains. I made the tiller arm attached to the bottom of the rudder.

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.*

About the author

Bill Steffes got into R/C in 1978 and entered his first scale R/C contest in 1981 at Jamesburg, NJ. Always interested in scale, Bill was a judge at the 1989 Top Gun scale invitational. In 1990, he entered Team Scale (with Nick Ziroli Sr. as pilot) campaigning his Ziroli B-25. A regular at Top Gun, Bill will team up with Frank Tiano for 1997 when they compete with a P-38 Lightning.

MODEL AIRPLANE NEWS

PRODUCT REVIEW

User-friendly 8-channel computer radio with graphic display

JR REMOTE CONTROL XP8103

by GERRY YARRISH

I HAVE used JR radios for a long time, starting with the ultra-simple JR* Max-4 system. At the time, the only bells and whistles I was interested in were servo-reversing switches. Since then, I have used most of the radios in JR's line.

Once you step from non-programmable radios to those with computer features, you start to find that many of the setup and function features previously thought of as "kinda nice to have" suddenly become "must-haves." JR's new XP8103 takes these must-haves and arranges them in an easy-to-deal-with way. Here's what I found.



The XP8103 is JR's newest generation multifunction programmable radio system. Its large display screen makes programming very easy.

PHOTOS BY WALTER SOAS

INSIDE THE 8103

The XP8103 is JR's newest generation multifunction, 8-channel system, and it follows in the line of past JR radios in that it has selectable programming for gliders, helicopters and fixed-wing aircraft. The 8103 is available in two transmitter (TX) types—one designed primarily for airplanes and gliders, the other for helicopters. Both TX types have identical software, but in each case, the switches and knobs have been optimized for the particular type of model. The XP8103 is also available in either Mode I or Mode II orientation.

The radio has a 10-model memory capacity and a large easy-to-read LCD screen. Moving up from an X347 system, I found that the 8103's larger display screen and simplified screen-selection layout almost let you program the radio without using its well-illustrated manual.

The screen's large size also means that important words are completely spelled out rather than abbreviated in some sort of computer-radio display code. More about this later.

The TX case is made of molded plastic, and the back of the case is recessed slightly to provide a wraparound finger grip for a comfortable feel. On the face and top of the TX, the control knobs and switches are arranged much like those of other JR radios, and all are within easy reach. Control sticks and trim levers are conventional, and the input keys are arranged along the bottom of the TX face. Labeling for all function switches, knobs and input keys is clear and easy to read.

When you initially turn on the radio, the Normal screen display appears. This screen displays transmitter voltage in a bar graph across the top as well as the modulation setup for the radio. The model memory number and the model's name appear below the voltage bar. A graphic (picture) of an airplane, heli, or glider indicates the program selected, and the integrated timer display is also shown.

The display's contrast is also adjustable and can be made lighter or darker by pressing and holding the Select key and then pressing either the Data + or - keys.

INPUT FUNCTIONS

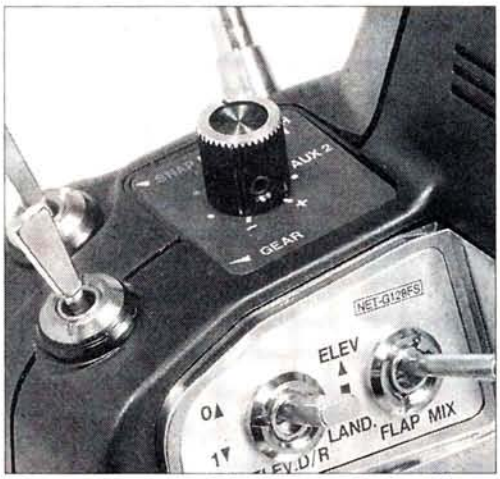
The logic behind the input key functions is well-thought-out, and it is easy to find your way around. As is normal with most computer radios, there are two menus to navigate: the System-setup mode and the Function mode. Entering either mode requires that you press and hold both the Mode Up and Mode Down keys at the same time. Doing so before the TX has been turned on brings up the System-mode screen, while pressing both keys after the TX has been activated brings you to the Function screen.

Included in the System Mode menu are:

- Info Display (initial display mentioned above).
- Model Select and Copy functions (one of 10 model memories stored).
- Model Name (up to eight characters, upper- and lower-case letters and many symbols).
- Type Select (heli, acro, or glider).

• Model Reset (all functions return to factory default).
• Modulation Select (S-PCM, Z-PCM, or PPM to match receiver being used).
• Data Transfer (transferring setup data from one radio to another using the Direct Servo Control cord).
• Wing Type Select (normal, flaperon, or delta).
• Spoiler Channel Input Select (aux 2 pot or mix switch).

Included in the Function Model menu are:
• Dual rates and exponential (elevator, aileron, rudder).
• Servo-reversing (all channels).
• Electronic sub-trim (all channels).
• Servo-travel adjustment (endpoints).
• Elevator-to-flap mixing.
• Aileron-to-rudder mixing.
• Landing system (auto link for spoiler/elevator/flap; selectable and adjustable).
• Snap roll (four directions).
• Aileron differential (more up- than down-travel).
• Trim offset memory (to store trim setting for different models).
• Flap pot/knob adjustment.
• Programmable mixing (six types, of which two are multi-point).
• Programmable fail-safe (PCM).
• Programmable trainer function (selectable master/slave channels).
• Stopwatch/countdown timer and internal system timer.
• Servo-output bar graph.



The top left corner of the TX case. Snap roll/stopwatch activation, aux 2, flap mix landing gear and elevator dual-rate switches are at your fingertips.

THE BIG PICTURE

As previously said, the large size of the display screen allows much more information to be displayed simultaneously. In the Dual Rate/Expo display, for example, there is a graphic that shows the amount of exponential output for each channel. In the Sub-Trim display, four channels (throttle, elevator, aileron and rudder or gear, flap, spoiler and aux 3) are displayed together as two separate selection menus, and you can move the cursor around each menu by pressing either Channel key to make your selections. Pressing the Select key toggles the display between the two selection menus. The same is true for travel adjustment.

What I really appreciate in the 8103 is the Function List display. Once the radio is in the Function mode, you can press the Mode Down and Select keys at the same time to bring up the Function List. Ten of the 20 function displays are shown on the Function List screen. Pressing the Select key toggles you between two list screens. Pressing either the Mode Up or Down key allows you to select the function you want displayed. Then, by pressing the Mode Up and Down keys at the same time, you bring up the Function screen you've selected from the list. The Function screen remains on the function you've selected every time you re-enter the Function mode. In a nutshell, instead of having to scroll through the entire Function menu to find the one you want, the Function List screen provides a shortcut to where you want to go.



This is the standard PCM aircraft airborne pack, which includes four NES-517 servos.

MIXING FUNCTIONS

Again, the 8103's large display screen provides a graphic that's easier to interpret than most. From the Function mode, you select the mix number you

SPECIFICATIONS

Model: XP8103

Manufacturer: JR Remote Control

Transmitter: 8-channel, 10-model memory; selectable modulation (S-PCM, Z-PCM, PPM)

Receiver: NER-649S (9-channel, FM-ABC & W, S-PCM)

Servos: NES 517 (40.3 oz./in. torque), ball bearings

Accessories: 4 servos, switch harness, 4.8V 600mAh flight battery pack

Weight of airborne system: 10.68 oz. (four servos)

Price: $469.95, FM aircraft; $529.95, FM heli; $549.95, PCM aircraft; $649.95, PCM heli.

Features: the XP8103 has 8 channels and 10-model memory. Its programming is selectable for airplane, heli, or glider setups, and it has a large, easy-to-read LCD screen. The 8103 comes with a 9-channel ABC & W receiver and four ball-bearing-equipped servos. A standard wall charger, a 600mAh receiver battery pack, a switch harness and basic servo-mounting hardware complete the package. The TX control sticks are adjustable.

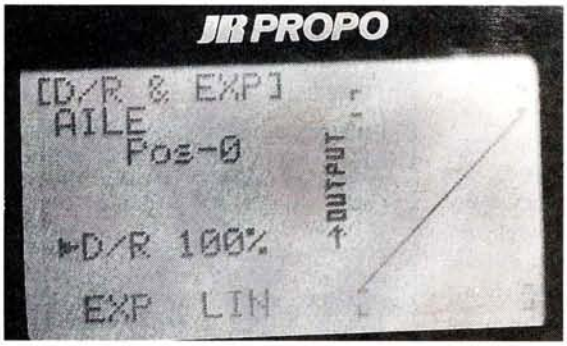
Comments: the JR XP8103 comes with all the features you would expect for a competition-level radio, with the possible exception of not having an unlimited switch-position-designation feature. The radio's function has been simplified enough to make it also attractive to the serious sport flyer.

Hits
• Large display screen.
• Important display words spelled out (not abbreviated).
• Function list display.
• Mix with trim feature (see text).
• Multipoint mixing.

Misses
• None found.



The large display screen shows a great deal of information. Here, the first of two Function Lists is displayed. The cursor (arrow) is on the dual rate/expo display.



Once the dual rate/expo title has been selected from the Function List, pressing both mode keys brings up the display. The graphic display to the right of the screen visually shows the expo or dual-rate curve. The percentages are also shown numerically.



The servo-output display shows the movement and direction of travel for all the servos in multiple bar graphs. The display allows you to check mixes and function setup without having to turn on the RX and servos.



The input keys are arranged along the bottom of the TX face.

want (1 through 6). Initially, the Mix screen shows that the function is inhibited. Pressing either the Data + or - key activates the function. For Mix 1 and 2, there is a multi-point mix display that gives you five adjustable points and allows you to custom-tailor your mix function. Any channel can be slaved to any other channel and mixed in any ratio. Switch assignment allows On (always on), Mix (activated with a switch), Land (for landing switch activation) and Elev.>F. (elevator-to-flap switch activation).

Examples of multi-point programmable mixing would be aerobatic pilots dialing out roll and pitch coupling during knife-edge flight for all rudder-control stick positions and heli flyers setting up custom tail-rotor torque compensation or throttle and rotor pitch curves for their particular engine/heli combination.

Mixes 3 through 6 are standard mixes, and the display allows you to select the Master and Slave channels, the mix rate (or mix value), assign and configure the mix switch (On, Mix, Land, Elev.>F., or Gear) and the mix Offset (or slave-channel neutral position). All mixes are activated with the Data + and - keys, and the Clear key deactivates the mix functions.

MIX WITH TRIM

Another really nice feature in the 8103 is Mix with Trim. Whenever the master channel is aileron, elevator, rudder, or throttle, you have the option of allowing its trim function to mix into the slave channel. Also in Mixes 5 and 6, Mix with Trim is always activated, so using separate elevator servos now becomes simple plug and play. I like this a lot!

In use, the 8103 is very comfortable to hold and easy to program. The old saying that the more complicated radios get, the easier they are to use certainly rings true here. Most of the basic functions and mixes are easy to figure out with the large amount of information shown on the large display screen. For the more complicated and precise mixing adjustments, the manual spells out the procedure for you and gives specific input key explanations.

The Servo Output bar-graph display shows you exactly what's going on as far as servo travel, direction and mixing are concerned. This feature allows you to check basic setup parameters without having to turn on your receiver and servos. At a glance, you can see whether the functions you've adjusted are operating in the manner you wanted and in which direction. The bar graphs are marked to show 50, 100 and 150 percent of total ATV travel.

INSTRUCTION MANUAL

The instruction manual is organized for a very easy read, and like the radio itself, the instructions are in plain English and adequately illustrated with diagrams. The trick to using the manual quickly is to go to page 1. Illustrated there are the System Setup and Function mode menus printed in a flow chart for each program mode (airplane, heli and glider). Next to each display title is the page number for the written explanation. I like things simple, and the manual keeps me happy.

Combined with the NER-649S PCM receiver featuring JR's ABC & W signal-filtering system, the XP8103 makes a great competition-level system that's at home at any sport flying field. If you need an 8-channel radio with all the bells and whistles that are easy to use, then the XP8103 just might be the system you're looking for. Give it a try.

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.* ✦



by DAVE GIERKE

MOKI M-61 R/C-LS ABC

THE MODEL-LINE LTD. CO. (formerly Modelta Ltd. Co.) of Budapest, Hungary, has been producing Moki 2-stroke model engines since 1957 (the word "Moki" comes from Model Kiserleti Intezet, the Hungarian modeling association). More than 20,000 engines have been produced since then. For most of this time, Modelta was sponsored by the Communist government to produce modern equipment for Hungarian competition modelers to use at domestic, European and world (FAI) competitions.

With the collapse of the Soviet Union, Model-Line Ltd. has emerged as a private firm in a free Hungary while expanding its model engine market throughout the world. Gerard Enterprises Inc.*, of Waukesha, WI, is the exclusive importer of Moki engines in North America. In addition to the Moki .61 R/C-LS ABC review engine, Gerard carries eight other sizes of Moki R/C engines, from the M-51 R/C ring (.51ci) to the huge M-360 twin R/C ring (3.638ci).

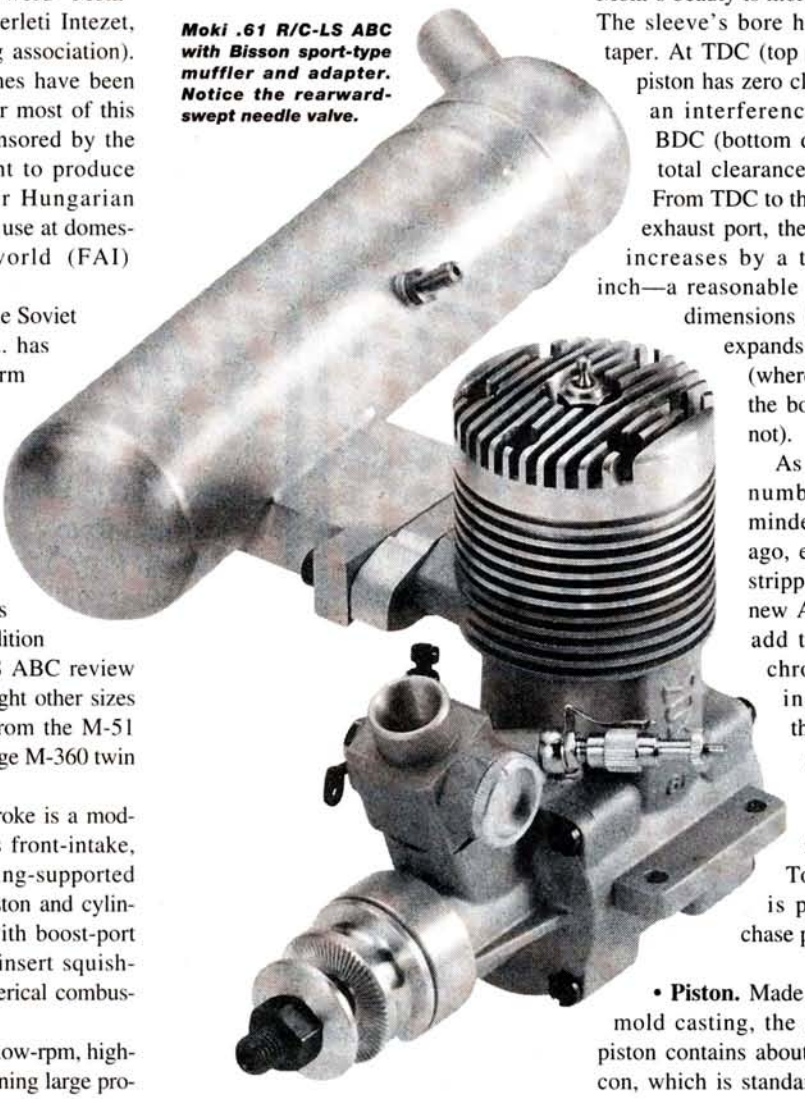
The Moki .61 long-stroke is a modern design that features front-intake, side-exhaust, ball-bearing-supported crankshaft, true ABC piston and cylinder sleeve, Schnuerle with boost-port transfers and a button-insert squish-band head with hemispherical combustion chamber.

Touted as a relatively low-rpm, high-torque powerplant for turning large propeller loads, the long-stroke concept has attracted a following. Although dynamometer tests conducted by Mike Billinton and me have failed to confirm this notion, the configuration is nonetheless competitive with engines that have square and over-square stroke/bore ratios.

CONSTRUCTION

• **Crankcase.** The crankcase is cast of aluminum alloy using the permanent-mold method. Externally, the casting is bead-blasted above the exhaust prior to the machining of the cylinder fins. Combined with a polished head, this technique produces a very professional-looking product.

• **Cylinder sleeve.** Fabricated of brass, the sleeve's hefty 0.077-inch wall thickness typifies Moki's commitment to excellence. The four-port sleeve is highlighted by one large exhaust and three transfer ports. The exhaust port is complemented by two Schnuerle and one highly angled (toward the head) boost port. The smooth, perfectly honed chrome-plated sleeve draws attention to the cleanly machined ports. There are no burrs or grinder marks here; only superb workmanship. According to Jim Gerard, Model-Line Ltd. doesn't possess expensive, CNC (computer numerical control) machinery. Everything is produced with manual equipment. Personally, I'm glad to see that highly developed manual skills still exist somewhere in the world.



Moki .61 R/C-LS ABC with Bisson sport-type muffler and adapter. Notice the rearward-swept needle valve.

PHOTOS BY DAVID C. GIERKE

Close inspection with precision measuring instruments proves that the Moki's beauty is more than skin deep. The sleeve's bore has a continuous taper. At TDC (top dead center) the piston has zero clearance (cold)—an interference fit—while at BDC (bottom dead center), the total clearance is 0.0051 inch. From TDC to the top edge of the exhaust port, the sleeve diameter increases by a total of 0.0023 inch—a reasonable combination of dimensions for a sleeve that expands more at the top (where it's hot) than at the bottom (where it's not).

As I digested these numbers, I was reminded that not long ago, engine modifiers stripped chrome from new ABC cylinders to add taper before re-chroming and honing. More often than not, this single modification changed an average engine into a winner. Today, this "trick" is part of the purchase price.

• **Piston.** Made of a permanent-mold casting, the aluminum-alloy piston contains about 20 percent silicon, which is standard for ABC-type engines. The casting is machined to exact standards. As an example, the diameter of the piston decreases by 0.0005 inch in the top 0.100 inch at the crown. This provides "lead," which allows the piston to avoid hooking the ports on its journey from BDC. The bottom of the piston skirt has two



Moki .61 R/C-LS ABC component parts. Machining excellence!

rectangular cutouts that are 180 degrees apart. These align with bypass channels in the case to provide an unobstructed window for the air-fuel mixture while the piston dwells around BDC. Here, the piston protrudes about ¼ inch below the sleeve.

• **Wristpin.** For lightness, the steel alloy wristpin is partially drilled (blind bored) from one end, then case-hardened and -ground to final size. It is allowed to "float" in the connecting rod and piston, maintaining a 0.0002-inch clearance. Two music-wire clips prevent the wristpin from contacting the sleeve. These snap into shallow, machined grooves at each end of the piston wristpin hole.

ENGINE SPECIFICATIONS

Displacement:	.609ci
Stroke:	0.945 in. (24.0mm)
Bore:	0.906 in. (23.0mm)
Stroke/bore:	1.043/1
Engine height:	4.140 in. (minus glow plug)
Engine width:	2.347 in.
Engine length:	4.675 in.
Width between bearers:	1.660 in.
Mounting-hole dimensions:	fore/aft-1.100 in., width-2.000 in.
Weight:	17.5 oz. (bare), 22.0 oz. (w/muffler)
Carburetor bore:	0.313 in.
B.hp:	2.3 @ 18,000rpm

Features: the Moki .61 long-stroke is a modern design featuring front-intake, side-exhaust, ball-bearing-supported crankshaft, true ABC piston and cylinder sleeve, Schnuerle porting with boost-port transfers and a button-insert squish-band head with hemispherical combustion chamber.

Comments: the Moki .61 R/C-LS ABC is an engine you can be proud of. Its superb design, high-quality materials and outstanding workmanship will not disappoint. Moki's operational qualities are best described as docile for adjustment and powerful in performance. The engine should provide many years of trouble-free use.

Hits
- Nice design.
- High-quality materials.
- Outstanding workmanship.

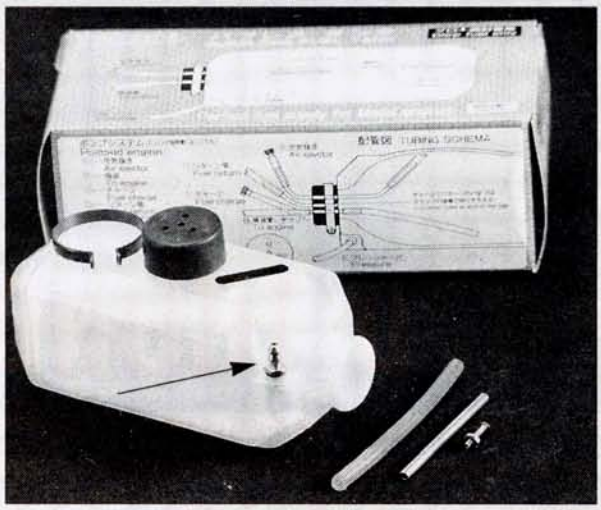
Misses
- None found.

List prices
M-61 R/C- LS ABC—$235
Bisson Pitts-style muffler (no. 01062) and adapter—$49.50
Bisson sport-style muffler (no. 01061) and adapter—$49.50
Gerard adapter plate for O.S. no. 744 B muffler—$5

SUPER TANK

The positive-expulsion fuel tank offers unsurpassed fuel-system performance, but are you willing to keep your end of the bargain?

I hate fuel tanks. Besides the engine, if there's one technical component that will fail, it's the tank. Have you ever been unable to adjust the needle valve because engine vibration caused air bubbles in the fuel line? What about the lean/hot engine run as the tank approached empty? You remember; the top of the piston turned blue and the compression disappeared. Or was it the time the piston ring welded itself



Simple-to-assemble components for Super Tank. Notice the pressure fitting (arrowed) has been already installed at the factory.

into the ring groove? How about the time you were showing off to your girlfriend? Just as you pulled out from that long dive, the engine quit; sorry, you had to land in the trees. One of my least favorite situations: getting a "no start" at a pylon race because the engine is hopelessly flooded. How did the fuel backflow through the pressure line with hemostats attached?

Once upon a time, I had a chance to win the national points championship in Formula II pylon racing. It was September, the final race of the year. All I had to do was *finish* the last heat of the day. I didn't have to win; just finish ... and victory was mine. After three laps, the engine quit. Later, I discovered it was the damned tank's fault! Because of chaos in the pits prior to the fateful flight, I forgot to refuel! All right, it wasn't the tank's fault, but the story's true.

From the previous misadventures, a serious message emerges: there's a better way to store and deliver fuel to your engine. Unfortunately, there's a price to be paid: the system is inconvenient. Most flyers would rather endure the deficiencies of an inferior, traditional tank than follow a few simple steps before and after each flight. Are you patient? Are you a perfectionist? If you are, Super Tank may be for you.

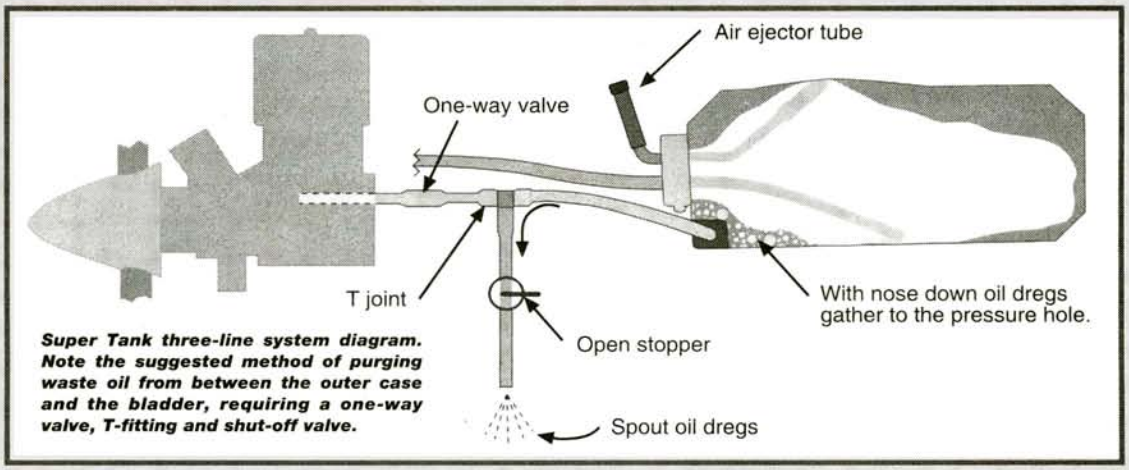
Super Tank was invented in 1972. I used it successfully for several years, then *Model Aviation* published its story in

the August '77 edition. Actually, NASA utilized the concept aboard orbiting and lunar spacecraft. Cryogenic (very low-temperature) propellants were delivered to rocket engines from positive-expulsion tanks. I borrowed, simplified and applied the idea to powered flying models.

Today, many racers and pattern flyers use the Super Tank. Produced by Tangiku Model Craft of Japan and distributed by champion pylon racer Dave Shadel (Performance Specialties*), the system is sometimes referred to as the "Tettra tank."

HOW DOES IT WORK?

In the diagram, note that a pliable rubber bladder has been sealed into a sturdy polyethylene tank. Pressure from the muffler or crankcase is directed between the outer shell and the bladder. A silicone fuel pick-up tube is placed halfway back into the bladder with no clunk weight. The simplest system consists of two lines—one line to the engine's carburetor inlet and one pressure line. To fill the tank, you must collapse the bladder completely by using a syringe connected to the fuel-feed line (which has been disconnected from the engine). When a slight vacuum is felt at the syringe, the bladder is completely empty. Pinch the fuel-feed line with hemostats and disconnect the syringe. You may now fill the bladder with a measured amount of fuel.



Super Tank three-line system diagram. Note the suggested method of purging waste oil from between the outer case and the bladder, requiring a one-way valve, T-fitting and shut-off valve.

Example: pylon racers use 7 to 7.5 ounces of fuel in the 8.5-ounce tank for Formula I. It's important not to overfill these tanks to avoid damaging the fragile bladder.

From my "Super Tank" article:

"When the engine starts, pressure forces fuel from the airless bladder through the fuel line and into the needle valve. ... Since there is no air in the bladder, there can be no foaming. The bladder collapses uniformly ... therefore, pick-up tube positioning is unimportant. ... Super Tank is not affected by external forces such as gravity and inertia. These forces continually affect the fuel in a conventional tank, sloshing it about madly. Fixed pickups for these tanks tend not to remain submerged. Clunk-type tanks have mechanical and kinetic problems related to external forces."

Crankcase flooding is impossible with this system. Throttling is accomplished without problems when muffler pressure is incorporated.

The tank will empty itself to the very last drop. Toward the end of an engine run, the bladder looks like a flat, wrinkled prune. Never again will you be forced to land with fuel left in the tank. The Super Tank operates at the proper needle-valve setting until the last second; then, it merely loses rpm and stops. Never again will your engine be subjected to the wearing effects of lean operation toward the end of the flight, as it is with conventional tanks.

Fuel and oil residue from the pressure line will accumulate between the outer tank and the bladder. After every few runs, it's suggested that approximately 1 ounce of fuel be injected into the tank through the pressure line and sloshed about. Then, fill the bladder with the syringe to evacuate the residue back out through the pressure line.

Now that you know the story, can you endure the additional procedures required by this superior product? If you can, the reward manifests itself as superior performance.

The 8.5-ounce tank (glow fuel only) used for this review costs $24.95, plus shipping. Contact Performance Specialties at (702) 265-7523 for further information concerning other sizes and prices.



Early Super Tank with balloon bladder being assembled. Notice the glass-jar prototype in background.

• **Front housing.** The front housing is made of a permanent-mold casting of aluminum alloy. It retains two ball bearings for crankshaft support and facilities front rotary-valve induction. The rear bearing has an i.d. of 17mm (0.669 inch) and an o.d. of 30.1mm (1.185 inch). The front bearing has an i.d. of 8mm (0.3147 inch) and an o.d. of 20.05mm (0.868 inch). The carburetor is secured to the housing by a steel draw-bar mechanism in conventional fashion.

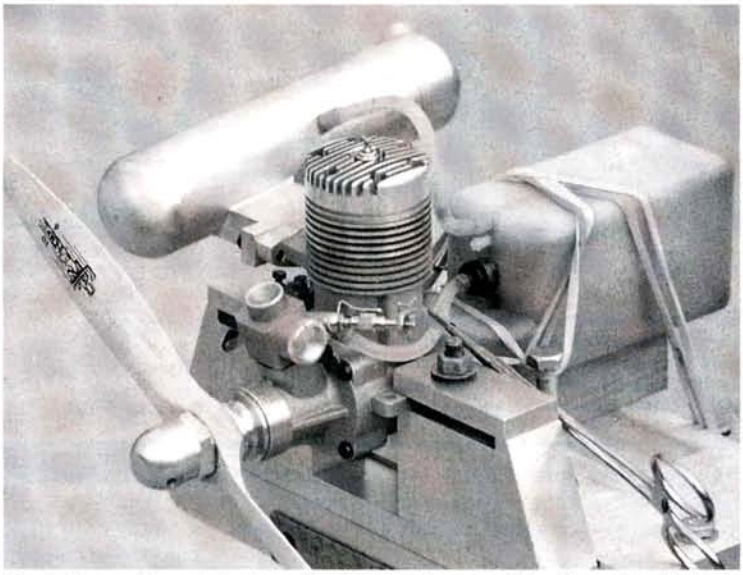
A small-diameter hole (0.030 inch) is drilled from behind the outer race of the front bearing (at the top) to the front of the housing's induction hole, just below the neck of the installed carburetor. This technique is used by several designers to solve a potential fuel-leakage problem through the front crankshaft bearing. This can amount to an occasional drip or a virtual flood, depending on the severity and location of clearance between the crankshaft and the inner housing. This tiny communication hole was designed to provide negative pressure at the front bearing, sucking excess fuel into the induction passageway. Sometimes it works; sometimes it doesn't. Regardless, this front-end leakage problem has plagued designers and manufacturers of 2-stroke engines since their inception. If you purchase any new engine with a serious front-end leak, don't fool with it; send it back for replacement. The test engine didn't leak a drop!

• **Crankshaft.** Featuring one-piece construction, the steel-alloy shaft has a 0.470-inch-diameter air-fuel passageway that runs from the milled induction hole to the rear face of the counterbalance. The case-hardened and -ground unit is exquisitely machined to the most exacting standards, e.g., both ball bearings are push-fit to their designated positions on the shaft—not too tight, not too loose. The propeller shaft thread is 7x1mm. The shaft is retained at the front bearing by the popular and effective tapered split collet and prop driver method.

• **Cylinder-head button insert and finned retainer.** The machined aluminum-alloy head consists of two pieces: the button insert and the finned retainer. The button insert contains the squish-band, combustion chamber and tapped glow-plug hole. It fits closely within the cylinder (0.0002-0.0003 inch) to a depth of 0.135 inch, where a 0.008-inch soft-aluminum head gasket is sandwiched between the insert flange and the top of the sleeve. The insert is clamped into place between the finned retainer and the crankcase by six, 4x12mm machine screws.

• **Muffler and adapter plate.** Strange as it may seem, Model-Line Ltd. provides their engines with muffler mounting sites but not mufflers. Gerard Enterprises corrects this inadequacy by furnishing Bisson mufflers for this line of Mokis. For the 61 LS-ABC, two models are available: the Sport (no. 01061) and the Pitts (no. 01062) configuration. Adapter plates made of bar-stock aluminum are fastened to the engine by two recessed 4x10mm pan-head machine screws. Then the muffler is fastened to the adapter with two 4x16mm Allen-cap machine screws; wrench provided.

In comparing the Bisson sport model and the quiet, well-respected Snuf'ler muffler, Gerard says, "... the dB measurements for both mufflers will be the same with any normal prop; however, the Bisson muffler will allow the engine to turn approximately 5 percent faster. ... [Also,] the Bisson sounds much lower in pitch and intensity."



Ready to run. Hemostats clamp the fuel line to prevent flooding when the tank is full. A sturdy test stand is required for break-in procedures.

Another option is to use the O.S.* no. 744 B muffler with the Gerard adapter plate; they match perfectly.

• **Carburetor.** Highlighted by all-metal construction, the Moki carburetor is very similar in appearance to K&B's* design. It has a high-speed needle valve and a large aluminum disk for trimming the idle and transition-speed air/fuel ratio. With only two adjustments, the carburetor is very user-friendly. An O-ring seals the carb body to the front housing, helping to minimize air leaks.

Moki's needle-valve assembly reflects a trend toward safety and convenience within the engine manufacturing community. Slanting rearward, it is well behind the spinning propeller and out of harm's way.

ENGINE OPERATION

I decided to use a Zinger* 11x6 propeller for break-in. This relatively low-load unit would allow the engine to run easily at slightly elevated rpm—ensuring adequate cooling. I was almost out of fuel, so I mixed a new batch—enough to complete all the required testing: 15 percent nitromethane, 20 percent oil (10 percent Klotz* castor oil, 10 percent Klotz KL-200 synthetic) and 65 percent methanol—my standard formula for this type and size of engine. The weather was great, and test conditions were ideal:

- Temperature—70 degrees F.
- Barometric pressure—29.20 inches Hg.
- Wet-bulb temperature—61 degrees F.

Review engines are taken apart, cleaned, measured and reassembled after the running phase of their evaluation. Although it's sound policy to remove an engine's backplate and check for burrs or loose metal chips, I've gradually moved toward discontinuing the practice because quality control has improved dramatically over the last 30 years. However, as a minimum requirement before starting any new engine, check for loose screws and components.

As I fastened the engine to the test stand, I was distracted by a problem with

the support equipment: the power-panel battery was discharged. Rather than wait to recharge, I substituted a chicken stick for the electric starter, a fuel-bulb for the pump and a Hobbico* Hot-Shot portable glow starter for the power-panel unit. Unfortunately, this deviation from my normal routine caused me to forget my checklist. Since this was my first experience with a Moki engine, I wondered about starting, handling and break-in questions. I'd soon learn about these ... and more.

After fueling, setting the needle valve, choking and applying glow-plug heat, the Moki was ready to run—I thought. It started with a few flips. As I quickly moved behind the test stand to adjust the needle valve, I noticed the carburetor slowly rotating toward the spinning propeller! When I pinched the fuel line to shut the engine down, the carburetor popped out of the front housing, barely missing the propeller. The fuel line saved the day by pulling it backward. As the engine slowed to a stop, I noticed bubbles foaming from around the glow plug; it was loose, too.

Fortunately, there wasn't any damage, but the air turned blue for a few seconds! I forgot one of the basic rules: *always check everything for tightness before start-up.* This unusual situation served as a sober reminder that no one is immune from accidents resulting from lack of attention or forgetfulness.

A few safety notes: when running any engine, wear your safety goggles and hearing protectors. To adjust the needle valve, always move behind the engine after it has started. Remember, don't reach around to the front of the propeller with a tachometer. From a safety standpoint, straddling the propeller (placing your body within the propeller's plane of rotation) is one of the worst things you can do. I know it seems natural to hold the tach out front while "tweaking" the needle with the other hand, but sooner or later, a propeller will disintegrate, fly off the shaft, or kick something up from the ground—not a pleasant thought if you are in the line of fire. If this sounds like preaching, so be it. A periodic review of personal engine-handling techniques will help prevent accidents.

Break-in required about 30 minutes before the engine held a strong, peaked, 2-stroke setting. This was accomplished with successive 2-minute runs at a rich 2-stroke speed (12,700rpm) for the first 16 minutes. Finally, there were five sets of 3 minutes each. These required patient needle-valve adjustment from 2-cycling rich to peak rpm. This condition was held for a few seconds before backing off to the initial setting. The entire procedure was then repeated several more times until the 3 minutes were up.

Next, the Moki was tested with seven APC propellers. I selected these as representative sizes used for pattern and sport-flying applications. The impressive rpm performance of each is recorded elsewhere.

- 11x6—13,700rpm
- 11x8—12,400rpm (94dB)
- 12x6—11,900rpm
- 12x8—10,400rpm
- 11x10—10,300rpm (88dB)
- 13x7—9,900rpm
- 11x12—9,100rpm

In terms of sound, the Moki/APC 11x8 propeller combination produced 94dB while turning 12,400rpm. With an APC 11x10, the sound level dropped to 88dB at 10,300rpm. My findings and those of fellow experimenter Frank Vassallo suggest that the propeller produces more sound intensity than a properly muffled exhaust above 11,000rpm for most 2-stroke-cycle 10cc engines. By reducing the shaft speed 2,100rpm, the sound intensity is halved twice. Stated another way, 75 percent of the original sound intensity disappears when the shaft speed is reduced 17 percent. The point? Slightly lower shaft speeds dramatically reduce noise.

CONCLUSIONS

The Moki .61 R/C-LS ABC is an engine of which you can be proud. Its superb design, high-quality materials and outstanding workmanship will not disappoint. Moki's operational qualities are best described as docile for adjustment and powerful in performance. The engine should provide many years of trouble-free use.

Gerard Enterprises provides the most comprehensive set of support materials in the industry. Owner success with Moki engines and accessories is enhanced because of their conscientious efforts in this often overlooked aspect of the hobby.

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.*



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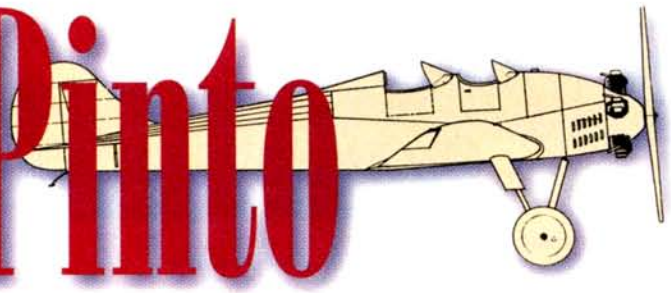
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CONSTRUCTION



Mohawk Pinto



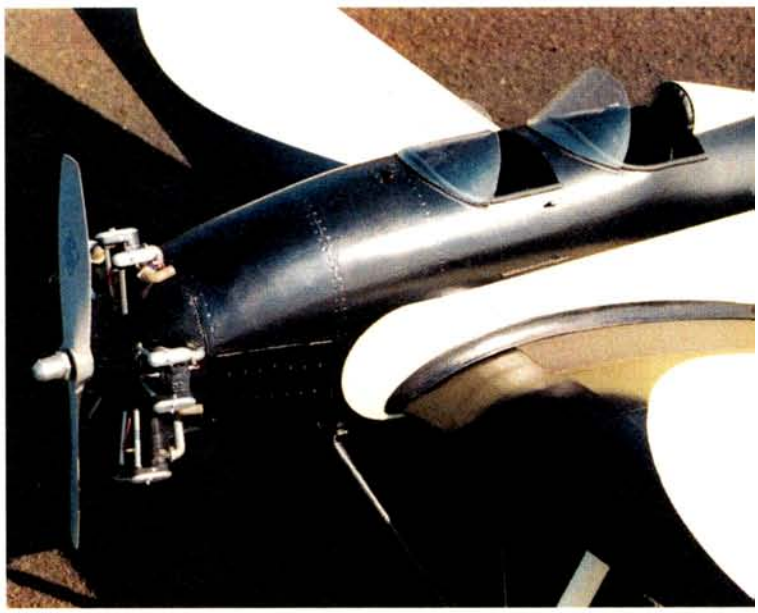
by PHILLIP S. KENT

1920s British Light Plane

I CAME across the Mohawk Pinto when I was researching a previous model, the Nicholas Beazley NB 4. A small 3-view drawing was included within an article on the history and types of aircraft built by the Mohawk Co. Later, I managed to obtain some photographs and some data that matched up to my 3-view drawings. From this information, I was able to draw up the 1/5-scale model presented here. I chose 1/5 scale so that commercially available wheels could be used in its construction along with one of my reliable Laser .75 4-stroke engines. Since this model is intended for the more experienced modeler, I won't give you a glue-part-A-to-part-B essay. Rather, I'll give you basics of its construction and fill in some of the unusual points involved in its construction. Let's give it a whirl.

CONSTRUCTION

The fuselage follows the full-size design structure in that it is a basic box made of longerons, verticals and diagonals. The basic box uses 1/4-inch-square spruce for the longerons while the uprights and crosspieces are made of 1/4-inch-square balsa. The smaller diagonals are made of 1/8x3/16-inch balsa and are installed in the side framework so that they do not touch the covering of the finished model (flush with the inside edge). The two main sides are built directly over the plans, and the 1/4-inch-thick wing-saddle sheeting ties the top and bottom longerons together while



PHOTOS BY PHILLIP S. KENT

SPECIFICATIONS

Name: Mohawk Pinto

Type: scale monoplane

Wingspan: 86 in.

Wing area: 1024 sq. in.

Weight: 10 lb.

Wing loading: 22.5 oz./ sq. ft.

Airfoil: semisymmetrical

Length: 58 in.

Radio req'd: 4-channel (rudder, aileron, throttle, elevator)

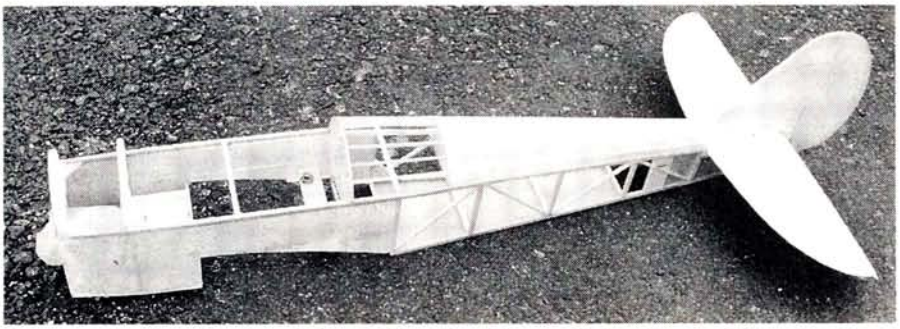
Engine req'd: .45 to .60 2-stroke; .65 to .90 4-stroke

Engine used: Laser .75 4-stroke

Features: the Mohawk Pinto is an unusual British light plane from the 1920s, and the model uses traditional balsa-and-plywood construction. The wing is built in three sections and joined over the plans. The ailerons are cut out of the finished wing panels and then hinged into place. The tail feathers are built using the core method, which produces lightweight, strong surfaces that are quick and simple to assemble. The original model was fabric-covered and painted.

1/8-inch-balsa filler sheet is used to support the area below the horizontal stab (note grain direction on all filler sheeting).

The shape of the fuselage is formed with balsa and plywood formers while 3/16x3/32-inch spruce stringers produce the rounded form of the turtle decking. The nose section is planked with strips of 1/8-inch sheet balsa due to the double curvature you need to cover in this area. I used 1/64-inch-thick plywood to cover the area where the cockpit openings are situated, but I installed the plywood after I had covered the bottom, sides and rear decking with fabric.



The basic fuselage structure built and the tail feathers added and covered. Construction is straightforward and simple.

The fuel tank is positioned directly behind the engine in a fuelproofed compartment. I used beech hardwood rails to mount my Laser .75. If you intend to use another brand of engine, you will have to determine the width of your engine before you cut the opening in formers F1, F3 and F4. This way, the space between the rails will be wide enough to fit your particular engine. On the original model, I made scale inspection panels aft of the firewall so I could access the fuel-tank compartment (see photo), but this is not a necessary feature. You can simply cover the area with balsa in the usual way and get to the fuel tank through the wing-saddle area.

LANDING GEAR

The landing-gear wire is mounted on small aluminum or mild steel brackets that are bolted into place on the fuselage. The shock-absorbing Oleo struts are scratch-built using 1/2-inch-o.d. steel tubes available from automotive supply stores. The attachment point for the strut is made from a wood screw that's threaded into beech blocks mounted in the bottom of the wing. The screw must be filed or machined flat on both sides to form a spade fitting, and an appropriately sized hole is drilled through it to attach to the strut's top attachment fitting. A bearing is silver-soldered into the bottom end of the Oleo strut, and another bearing is then soldered to the top of the telescopic rod forming the piston that's attached to the landing gear. A suitable spring is inserted above the piston and is held in place by soldering the top attachment fitting into place at the top of the strut. The end of the piston rod is then filed or machined flat, and a hole is drilled into its end so it can be bolted to a brass attachment bracket that is soldered to the 5/32-inch-diameter axle wire. A pair of William Bros.* 5 1/4-inch-diameter vintage wheels completes the landing gear.



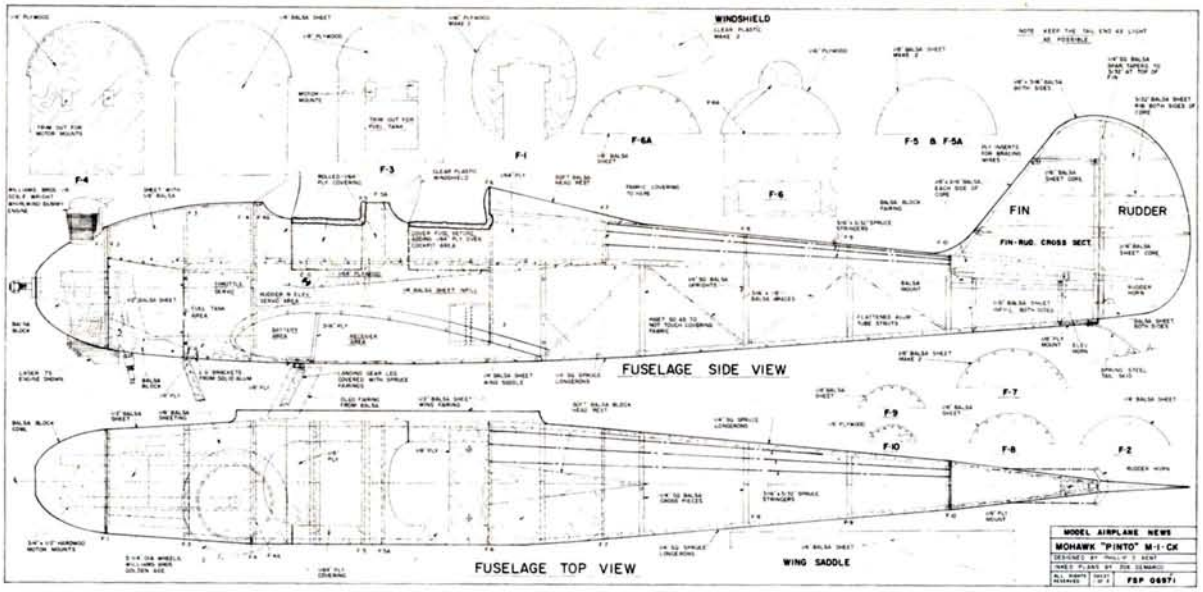
Here is the completed wing; the aileron has been cut out and temporarily hinged into place.

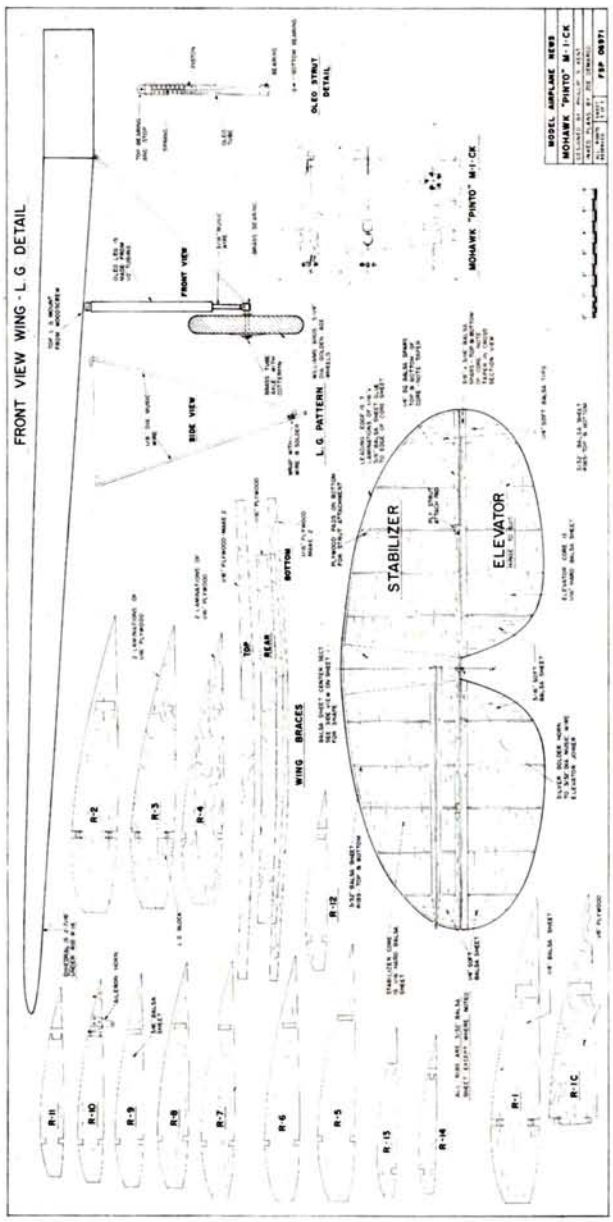
The trailing edge is a lamination of plywood and balsa; note the laminated aileron rib (second from left end). The aileron control horn slips into the slot.

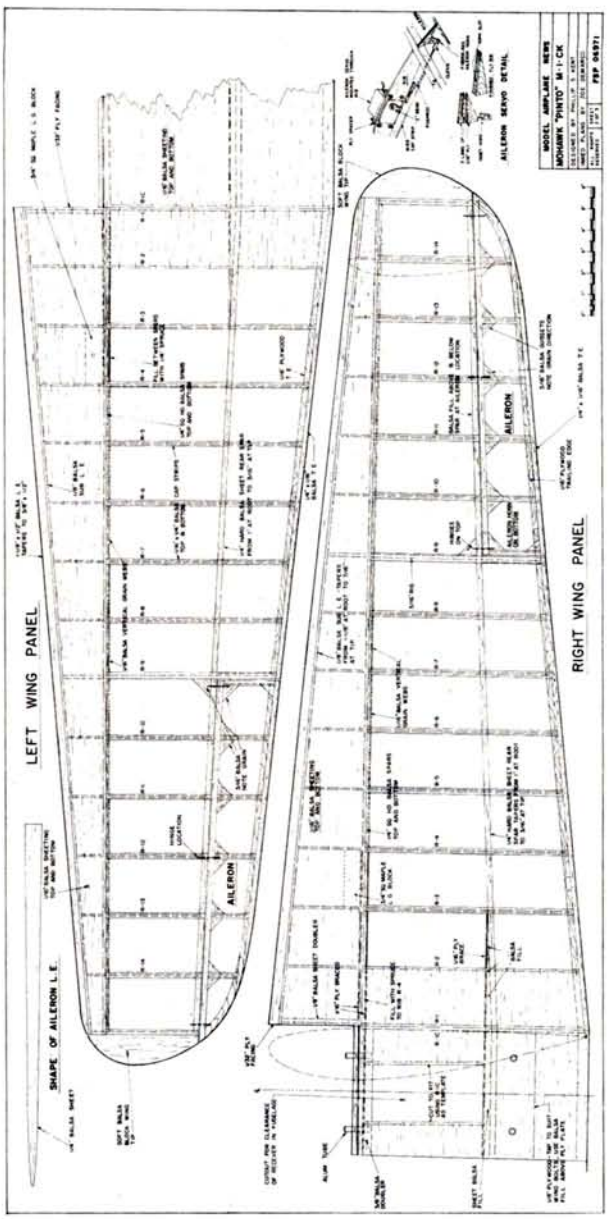
THE WING

The wing is built using traditional techniques and employs one-piece, 3/32-inch-thick balsa ribs. Plywood ribs are used in the landing-gear-mount-block area for increased strength. The main spar is made up of hard, 1/4-inch-square balsa top and bottom spars joined with 1/16-inch vertical-grain webbing that is glued into place after the ribs have been attached. The aft spar is made of 1/4-inch-thick balsa sheet and tapers from 1 inch at the root to 3/16 inch at the wingtip.

Assembly of the wing begins with pinning the bottom main spar to the plans and then sliding all the ribs onto the aft spar. The ribs are then placed on the main spar and glued into place. The trailing edge is made of a lamination of 1/16x1/2-inch ply and 1/16x1/4-inch balsa, as shown on the plans. This lamination is then placed under the ends of the wing ribs. Washout is achieved by placing 1x1/4-inch TE stock under the wing's trailing edge. The TE stock is situated so that it acts as a wedge to lift the trailing edge 1/4 inch at the tip rib and just touches the root rib. Once the TE stock is in place, glue the ribs to the aft spar and glue the ribs to the wing's TE. Care should be taken to avoid





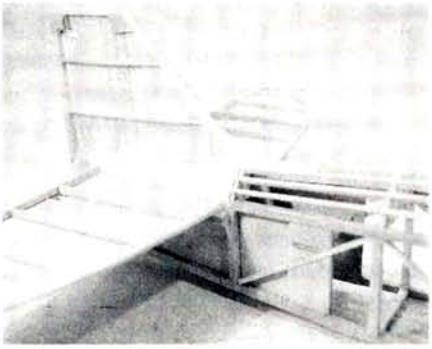


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gluing the TE stock to the wing.

Next, glue the false LE to the ribs followed by the top main spar. The 1/16-inch vertical-grain shear webbing can now be added between the ribs as well as the balsa filler strips along the upper edge of the aft spar to outline the aileron cutout area. Also add the aileron gussets. Now build the second panel in a similar fashion.

The center section should now be built.



Tail construction uses the core method with a 1/16-inch balsa sheet cut to the outline of the fin and stab. Elevators and rudder are built in a similar fashion.

Before you remove the center section from the building board, fit and glue into place all the dihedral braces as well as the upper sheeting. Place the center section and one of the outer panels over the plans and replace the TE stock wedge under the TE. Slide the wing panel into place so that the 1/16 inch plywood dihedral braces fit into the slots cut in ribs R1 to R3. Add balsa filler between the aft dihedral brace and the aft wing spar. Shape the top edge of the false LE so it matches the curve of the ribs, and add the 1/16-inch top LE sheeting as well as the 1/16x1/4-inch rib capstripping. Now install the other outer wing panel in the same way. Wing dihedral is determined by the shape of the plywood dihedral braces and you should end up with 2 7/16-inch dihedral under rib R-14 in each wing panel.

At this stage, the wing can be removed from the building board and the bottom sheeting and capstripping added. Sand the face of the false LE flat, and add the LE stock and carve and sand to final shape. Add the wingtip blocks, carve and sand them to shape, and then cut the ailerons out of the wing. Sand the face of the upper and lower filler pieces and the aft spar that forms the new TE smooth. Add the LE to the aileron, then cut, bevel and sand it to shape.

The original model had top-hinged ailerons, but the full-size aircraft had Frise-type hinging. There's no reason why this type of hinging could not be incorporated in the Pinto. It is up to you. See the detail on the plans for my aileron-horn detail. The horns are made of fiberglass printed-

MOHAWK PINTO

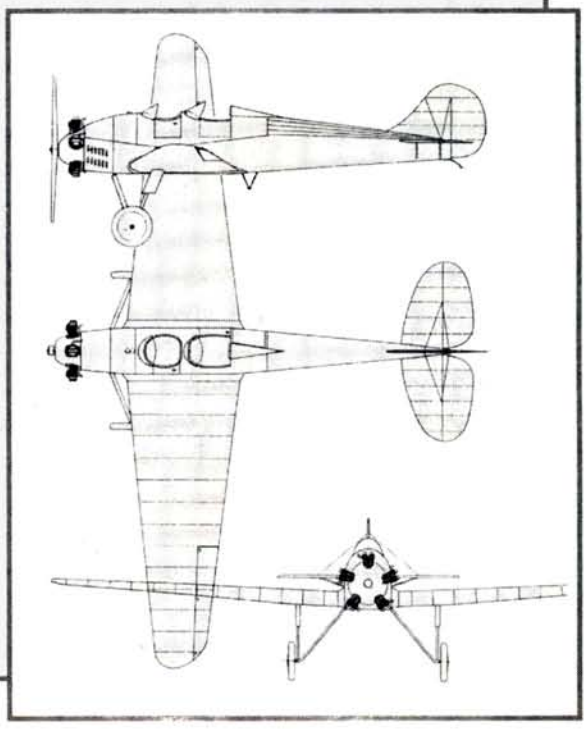
The Mohawk Aero Co. of Minneapolis was formed in 1927 by Leon A. Dahlen, Wallace C. Cummins, George A. MacDonald and Sumner E. Whitney. "Chet" Cummins was in charge of design, and the first Pinto flew late in 1927. The original Pinto was a two-seat low-wing cantilever monoplane with particularly clean lines and entirely free of external bracing wires. Pilot and passenger were in the same cockpit opening with the seats staggered. The pilot's seat was forward and to the left of the passenger seat. This arrangement gave, it was claimed, all the advantages of seats in tandem with the convenience of side-by-side seating. The original aircraft was modified and developed into the more usual two-seat configuration with individual cockpits, and in this form, it was used by the sporting pilots of the day. The aircraft did have the reputation of being difficult to fly—understandable, at a time when the monoplane was looked on as a little unusual.

The fabric-covered fuselage was a welded chromoly-steel-tube box filled out with wooden formers and stringers. The two cockpits were well-protected with large windscreens. Dual joystick controls were provided, and when flying without a passenger, the pilot occupied the rear seat. A luggage locker was provided in the turtle decking behind the rear cockpit. The cantilever wings were in two pieces and were constructed from spruce and mahogany. The leading edges were covered in plywood, and Frise-type ailerons of steel-tube construction were used. The split-axle landing gear used shock-absorbing struts, and the 26x4-inch wheels were fitted with Bendix brakes. The tail unit was of chromoly-steel tubing, braced and fabric-covered. A spring-leaf tail skid was fitted as standard.

The first Pinto to be certified was the MLV version that used the 55hp, 5-cylinder Velie engine. Mohawk was still not satisfied with the Pinto's performance and the reputation the aircraft was getting so they had the design modified further by Prof. John D. Akerman. The new models, called the Spurwing and Redskin, were developed as the M-1-CW and M-1-CK Pinto. The CW version used the Warner Scarab engine, and the CK model was fitted with the Kinner K5 5-cylinder radial engine.

The new Pinto was a lively sporting aircraft for the private owner. It could be used for cross-country flights or to satisfy the sporting interest at the local airport or strip. Of sound construction, it stood up well to abuse and hard use, and it was well-suited to the primary and secondary phases of the U.S. pilot training scheme. One example, an M-1-CK, was tested by the Air Corps for possible use as a trainer. Tests were satisfactory but no orders were placed.

From the registration records, it would appear that five M-1-CK Pintos were built: NC67N, NC180N, NC297V, NC319V and the Military XPT-7. The M-1-CW was an even more lively aircraft, and it had enough power to execute just about all the aerobatic maneuvers of the day. Had conditions been more favorable, it is likely that the Pinto would have been built in greater numbers. The Mohawk Co. was experiencing financial problems and by 1931, it was no more.



SPECIFICATIONS

Mohawk Pinto M-1-CK

Wingspan: 34 ft., 11 in.

Length: 24 ft., 2 in.

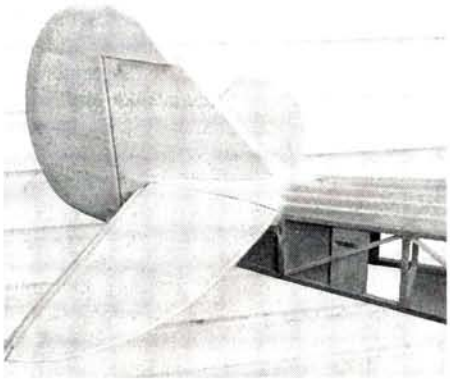
Height: 7 ft., 7 in.

Engine: 100hp Kinner K5

Max. airspeeds: 115mph; 98mph cruise ; 40mph landing.

Original factory price: $6,000; reduced to $4,800 in May 1930.

circuit-board material and inserted into the appropriate aileron rib. I installed the aileron servos in the wing panels in front of the ailerons for a simple, direct control setup. It's easier and quicker than using pushrods and bellcranks controlled by a single, center-mounted aileron servo. The plans show a simple installation with the aileron servo supported by a wing rib. You can cover the servo over with fabric or build an access panel on the underside of the wing. Sand the wing smooth and you're ready to cover.



The finished tail feathers.

TAIL GROUPS

The tail surfaces use the well-tried core method of construction. A 1/16-inch-balsa core sheet (note grain direction shown on the plans) is cut to shape, and then spars and ribs are added to each side and sanded to a final airfoil shape. To make the laminated edges, cut a template from scrap 3/8-inch plywood to the shape of the horizontal stabilizer. Cut three 1/16x3/8-inch balsa strips long enough to go around the template, glue them together and wrap them around the template. Tape them in place until dry. Use wax paper between the strips and the template to make removal of the strips painless. When this lamination is dry, glue it into place on the stab and sand to shape.

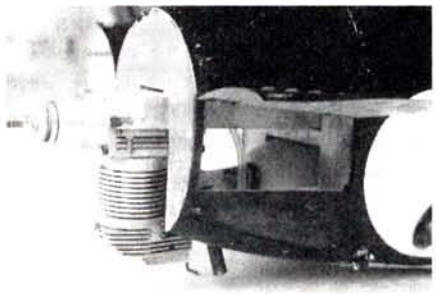
The finished tail is braced with wire and flattened aluminum tubes. Small plywood pads must be incorporated in the stab's construction to form mounting hard points for the bracing's attachment screws. The elevator horn is silver soldered to the elevator's center joiner wire, or you can use a commercially available horn/joiner.

COVERING AND FINISHING

I covered the model with Polytex iron-on fabric. This material sticks well to sheeted areas and is very stable after a coat of clear dope. You can, of course, use whichever fabric covering you like; Supershrink Coverite* or Sig* Koverall will give equally satisfactory results. Rib and stringer tapes can be added using strips of thin masking tape while simulating the stitches with glue applied with a toothpick.

The radial engine is a feature of this aircraft that just has to be duplicated, and there are several ways to make dummy cylinder heads. The original model used 1/6-scale Williams Bros. Wright Whirlwind plastic cylinders modified to look like Kinner K5 jugs. It would be possible to make them from many small plywood disks glued together but the William Bros.' offerings look much better and save much tedious work.

The color scheme of the original staggered cockpit Pinto was designed by aviation author and artist Douglas Rolfe. This black-and-cream or red-and-cream scheme was carried on all subsequent models in a modified form. My photographs give a good idea of how the model should be painted; the design is attractive, yet simple.



Here is the installation of my Laser .75 4-stroke engine. I installed functional inspection panels aft of the firewall, but this is not a requirement for the model. Note the hardwood engine-mount rails.

I did make a mistake, though: after further investigation, I found that the underside of the wing should be all black with cream-colored registration numbers.

For an unusual subject and for a model that is easy to build and fly, the Mohawk Pinto fits the bill nicely. You can detail it as much or as little as you like, and I'm sure you'll always be asked about it at the flying field. I hope you enjoy the Mohawk Pinto as much as I have.

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.*

FLIGHT PERFORMANCE

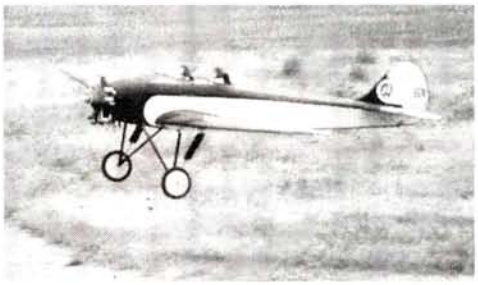
My model was completed one week prior to the Woodvale International Rally—one of the top scale events in the UK. Its first flight was the day before the event. The CG was too far back, and I had to add 1 pound of lead to the nose. Careful building of the tail will reduce this amount.

• *Takeoff and landing*

When flying off grass, the model performs brilliantly, and the Laser .75 provides ample power. The Pinto is, however, a challenge to operate off asphalt because of the non-steerable, spring-steel tail skid under the tail. Ground-looping has occurred. The model has a respectable tail moment and thus requires only a slight amount of rudder for takeoff. Apply power smoothly. Landings are also undemanding with power being used to control the descent rate.

• *High-speed performance*

Nothing unusual happens when you open up the throttle. Control is crisp and responsive, and only a slight amount of down-trim is required to fly straight and level.



• *Low-speed performance*

The model is best flown in the lower speed envelope if for no other reason than for scale appearances. Control remains comfortable, but you are obliged to use coordinated rudder and aileron for respectable turns. I use an aileron/rudder mixer, and this works very well. Stalls are gentle and show no bad habits.

• *Aerobatics*

At the contest, the model was asked to loop, stall turn and split-S, and it performed with reasonable success and placed a creditable 11th place. A slight dive to build up airspeed before entering a maneuver helps smooth things out. The model has proven very easy to fly, performs mild aerobatics with ease and, overall, is a real pussycat.



Scale TECHNIQUES

by GEORGE LEU

THE GREAT NORTHWEST HOBBY EXPO



This good-looking F-4 Phantom jet won first place in the Jet category. Built by Roy Mills from the new and improved Jet Hangar Hobbies kit, the phantom is painted in the carrier group markings of VF-142 aboard the USS America.

ONCE AGAIN, I had the opportunity and pleasure to attend the Northwest Hobby Exposition at Puyallup, WA. I was impressed with the overall quality and diversity of the R/C scale models competing in the static display competition. If I could suggest a general trend in the Pacific Northwest, it would be in the area of electric-powered scale. One of the individuals leading this movement is Bob Benjamin. Bob's beautiful Gee Bee Model Y took first place in Giant Scale and, in my opinion, deserved more. The Gee Bee is powered by an AstroFlight* Cobalt 90 motor powered by 36 cells. Bob did not hesitate to include scale rivets and panel lines along with a completely detailed cockpit interior. He started with an Ikon N'West* kit and modified it to make it much lighter. The final model is a masterpiece.



How's this for an electric-powered model? Bob Benjamin converted an Ikon N'West Gee Bee Model Y kit to electric and powers the model with an Astro 90 motor. Details galore.

There are numerous Best of Show awards presented at the Northwest Expo, and this does tend to confuse people at times. The award categories for aircraft, boat and car each have their own Best of Show award. However, there is also a People's Choice Best of Show award that is based on a ballot procedure. Anyone attending the show can vote for this award, and you can even vote more than once! There are no criteria for voting other than "what moves you." This year, as last, an aircraft that did not win Aircraft Best of Show did win the People's Choice Best of Show. Receiving an honorable mention in the Aircraft category, Cliff Oswald of British Columbia, Canada, received the People's Choice Best of Show Award for his impressive ¼-scale Spitfire LF Mk IXB. The winner for the Aircraft Best of Show award was Randy Hansen for his Cessna A-188 Agwagon. Randy's crop duster was scratch built and had detail you just could not believe.

Roy Mills won first place in the Jet category with his Jet Hangar Hobbies* F-4 Phantom. Roy's model is from the new and improved JHH kit that has an excellent scale outline. The JHH 4-F Phantom is a manageable size and a relatively inexpensive entry into the fast-paced world of jet modeling.

Two of the manufacturers I spoke to who had new products to introduce were Proctor Enterprises* and Usher Enterprises Inc*. The UEI people, Darryl and Bobbi Usher, showed off their new 90-inch-long, IMAA-legal F-106 Delta Dart. This ducted-fan-powered design comes apart in three sections for transportation, none of which is longer than 52 inches. Its 1,200 square inches of wing area should make the model an easy-to-fly subject as well as a good-looking historical jet project.

Proctor showed off their ¼-scale Fokker D-VII. With an 88-inch span and weighing in at between 20 and 25 pounds, this model is a perfect project for those wanting true WW I scale perfection. Finally being ready for purchase, two of these kits (one is for my dad) went home with me after the show. Buying any Proctor kit is an investment in quality. After speaking with Dick and Mark Heineinge, who were on hand at the Proctor booth, I purchased additional scale fittings, documentation books and D-VII wheels. For power, I plan to use a Laser engine (also available from Proctor). It sure is nice to have one-stop shopping. Give Proctor a call and get their catalogue.

MASTERS MOMENTS

I want to take this opportunity to congratulate Garland Hamilton for his first-place overall finish at the 1996 Scale Masters in Mesa, AZ. Garland is a fine scale modeler and flyer and very



Best of Show Aircraft and first-place Non-Military Scale award winner Randy Hansen's Cessna A-188 Agwagon was a feast for the eyes.



Denny Deweese took second place in Giant-Scale with this 1/4-scale Fokker D-VII built from a Proctor kit.

deserving champion. His version of the Lockheed DT-33A Drone Director built from a Bob Violett Models* kit has been developed over the past few years and is an awesome turbine-powered scale model. Among Garland's accomplishments are seventh place in the '96 Top Gun Expert category as well as Best Jet, and first place at the Jet World Champion-ships. Nice going Garland; semper fi!

Call me a home boy, but I also want to mention some accomplishments by two of my other friends, Nick Ziroli Jr. and Roy Vaillancourt. Nick received the highest score ever in the history of the Scale Masters (99.5) with his impressive, original-design Grumman TBM-Avenger. Nick says that the .5 deduction at the '96 Scale Masters was probably the result of his forgetting to "putty up" one of his cowl screws. Hey! That sounds like a neat scale technique. How 'bout it Nick? Maybe I can include it in a future column.

Roy did not attend this year's Scale Masters, but Eugene Job and Brian O'Meara flew Hawker Sea Fury designs built from Roy's Vailly Aviation* plans. Eugene and Brian placed first and fifth, respectively, in the Propeller Aircraft category at the Masters. Both these modelers are excellent scale modelers and flyers, but I think it's nice to give some of the credit for success to the designer. We don't see much mention of Roy's designs in the scale publications, and I tease Roy that his name is too long for the editors to get right! Having just finished building a Stinson L-5 from Roy's plans, I just wanted to tell you all how nicely drawn his plans are and how competitive Vailly Aviation designs can be.

COWLS BY LENNY

I got a press release from Lenny Stanko of Take Flight Model and Mold Inc.* for some of his great fiberglass stuff. Lenny's new line of replacement engine cowls are made of polyester resin, and are very well-done. Lenny has been doing fiberglass work for many years, and he has engine cowls for many designs. Presently, he offers cowls for the Midwest Products Super Stinker, T-6 Texan, Extra 300S, Super Stearman, Citabria, Giles G-202 and CAP 232 kits, Ziroli's Fokker Dr.1 triplane and Stearman PT-17/N2S bipe, Meister Scale's FW 190, P-47 Thunderbolt and F4U Corsair, Pica 1/6 scale Waco and the Global A-1 Skyraider, to name a popular few. Lenny also offers fiberglass wheel pants for many of the kits. Give Lenny a call, and see if he has a cowl for you.

RHINEBECK RUMORS

After hearing so many rumors regarding the future of the annual Rhinebeck WW I Jamboree, I spoke with event coordinator George Buso at this past WRAM show. Here's what George had to say: "1997 may well be remembered for the bold changes undertaken at the aerodrome to make the "Rhinebeck experience" even more enjoyable. The old Rhinebeck facility as well as the R/C jamboree, which is scheduled for September 6 and 7, 1997, will be changed dramatically. These changes will benefit both the full-size airshow audience as well as the scale R/C modelers flying at the aerodrome.

The old, familiar, bumpy, grass runway is going to be completely leveled and expanded. The runway's dimensions will be increased to twice its old width for the full length of the runway,



Lenny Stanko of Take Flight Model & Mold Inc. puts out a nice line of fiberglass engine cowls and wheel pants for many popular designs and kits. All his moldings are made from polyester resin.

and all the trees (yes, I said all) will be gone! The grandstands have been reconfigured and moved back from the flightline some 30 feet. Other obstructions and the mock WW I village have already been removed and will be rebuilt elsewhere at the aerodrome. The result of all this rebuilding will be an outstanding, unobstructed, flat flying area of several hundred yards in all directions. To better utilize these enlarged facilities, the Mid-Hudson Radio Control Society is going to sponsor a Jamboree Fly In in September rather than the competition-intense event presented for the last 30 years.

Major changes to the Jamboree format will include four flight stations centered on the flightline, with one traffic pattern. A landing circle will accommodate individual bomb drops and spot landings. In keeping with the Aerodrome's atmosphere, all models must be reproductions of aircraft flown prior to December 31, 1939. So, for the modeler, there will be more room to fly in, no trees to crash into and a larger pit area to work in. For the full-size aerodrome airshow, the Rhinebeck facility will be improved to better showcase Cole Palen's flying museum. The old-world charm of the aerodrome will be fun for everyone."



Darryl Usher of Usher Enterprises Inc. showed off his F-106 Delta Dart at the '97 Northwestern Hobby Expo. The F-106 is an unusual, IMAA-legal ducted-fan jet that should fly very well. The model comes apart for easy transportation.

FITTING THE BELLY PAN

Whether made from balsa or fiberglass, the belly pan is one of the more difficult parts of a model to install correctly. I think the reason is a lack of knowledge and modelers wanting to rush the procedure. Why? Probably, because belly pans aren't as noticeable as the upper surface details. A proper fit is important for the streamlining in aerodynamic terms and for static judging since a good fit of the model's parts is an integral part of your Craftsmanship score. Let me discuss how I installed the belly pan on my Usher Enterprises Inc. F-100 Super Sabre.

First, I made sure the wing was accurately seated on the fuselage wing saddle and aligned properly with regard to the stab and fin. Then I positioned the belly pan over the wing saddle to determine its correct length over the wing. Once I had cut the pan to length, I positioned it above the wing and used a felt marking pen to mark the shape of the pan where it contacted the wing's lower surface. By placing the pen on the wing while holding the pan parallel to the fuselage, I moved the marker along the pan to mark the side cut lines.

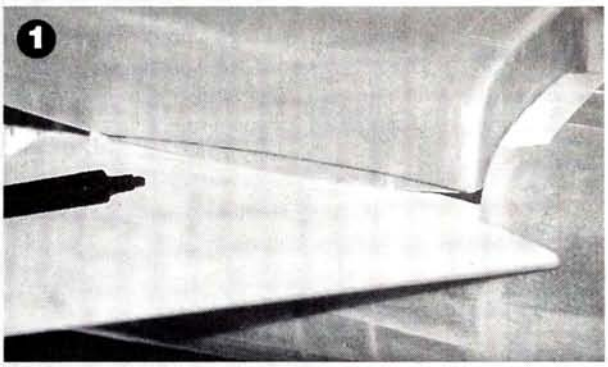
In the case of the UEI F-100, the belly pan is about 2 inches taller than the fuselage when placed over the wing. I used sheet metal cutters (tin snips) and cut along the line. The width of the pen I used to mark the pan puts the cut line about 3/8 inch above the wing, so several cuts were required to complete the procedure. I continued this way until I was within 3/16 inch of the desired pan height. At this point, to prevent chipping and cracking of the fiberglass material, I started to sand the belly pan, rather than cut it with the snips. Take your time with this. Like all scale modeling, it should be enjoyed and savored.



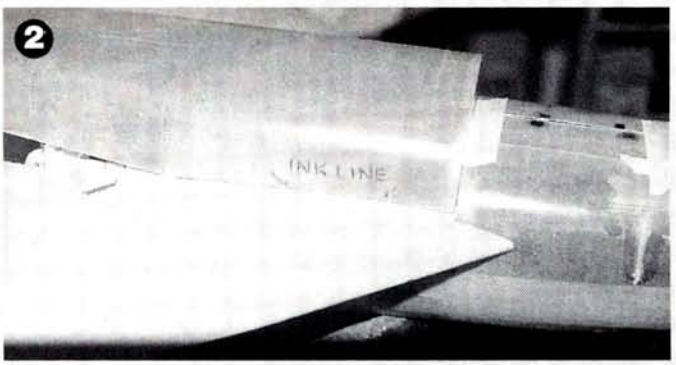
Giant-scale models like this Fokker D-VII built by Ron Whitlock are perfect for the annual WW I Jamboree held at Rhinebeck. (See text for the new changes awaiting you there for '97.)

A final sanding step involved taping a piece of sandpaper to the wing's surface and moving the belly pan back and forth until the pan fits perfectly over the open belly area. To attach the pan to the wing, I added some strips of glass cloth to the inside edge of the belly pan with CA glue and then formed a neat fillet where the parts come in contact with one another with epoxy glue to cement the belly pan into place. I like this method, how about you?

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.*

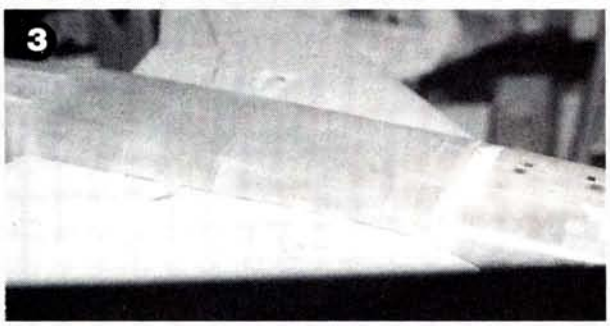


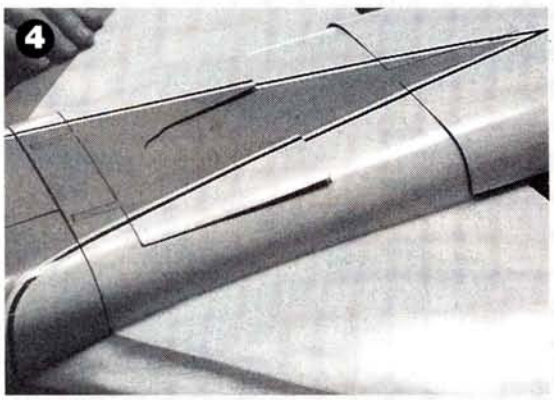
1. Start by cutting the belly pan to length then place it above the wing. Draw the cut line with a marking pen that's placed on the wing's surface while drawing.



2. Rough cut the pan to shape and test fit. Repeat the marking and cutting until you are close to the finished size.

3. When your are close to the final size of the pan, switch to sandpaper to true up the cut edge for a perfect fit.





4. Here the belly pan is installed on the finished model. Note how it blends smoothly into the rest of the fuselage. The main gear doors are also installed in this photo.

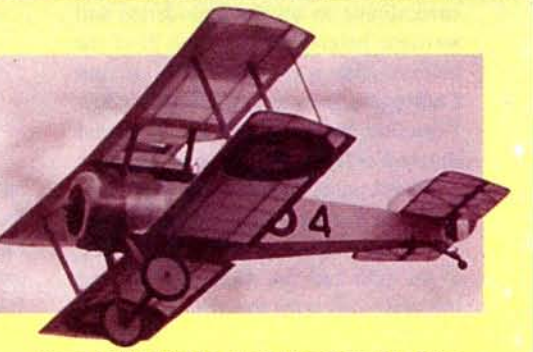






13th Annual R/C World

FESTIVAL OF FUN



Norm Holland had a great time flying his Balsa USA 1/3-scale Sopwith Pup. The 9-ft. model weighs 28 lb. and is powered with a Saito 300 twin engine swinging a 23 in. prop. The model is covered with Hobby Lobby Superfabric antique buff color and is clear-coated.

by WALLY ZOBER

TO SAY THE 13th Annual R/C World Fall Festival was a major success would be an understatement. The R/C World Flyers hold their Fall Festival each year on the weekend after Thanksgiving, and their 13th meet drew 70 registered pilots and 103 airplanes. The Festival is open to all types of fixed-wing R/C aircraft. Scale and sport models of all sizes dominated the sky. WW I pursuit planes, heavy metal, WW II fighters, several WW II heavy bombers and even some jet models were at the meet.



Hot dog pilot Stinger Wallace brought along a few truly impressive models. Shown here is his amazing 120-in.-span Grumman Skyrocket, which was scratch-built from enlarged Bob Holman plans.

R/C World, with its 450x50-foot paved runway, is in the suburbs of Orlando, FL. The field sports a screened-in clubhouse, a 500x60-foot low-cut-grass runway and a 6-acre lake for seaplane flying. The club also has a completely equipped "weenie wagon" (cooking facility) to meet the culinary needs of the spectators, pilots and workers. There is also plenty of room for primitive camping, motor homes and parking. A portion of the parking lot was set aside for hobby supply vendors, whom, I am told, did very well this year.

The Fall Festival is a three-day event starting on Friday morning with registration at 8:30. At a 9:45 briefing, pilots are informed of the basic requirements for safe and enjoyable flying. Flying began promptly at 10 a.m. and lasted until 4:30 p.m.



Joe Saitta campaigned his award-winning B-17G Flying Fortress. A superbly crafted giant-scale model, the B-17 has a wingspan of 10-ft. and weighs 36 lb. The bomber is powered with four Webra .40 engines turning 10x6 props and sits on electric-powered Likes Line retracts. The Fortress is guided with a Futaba Super Seven and is finished with Ultracote with clear-coat applied. Joe Saitta won the "Best of Show" award.

PHOTOS BY WALLY ZOBER



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Joe Grable took the "Best Civilian" award with his Cessna Skymaster 336. The Cessna drew a lot of attention from both pilots and spectators alike. The model is finished in NAPA auto paint and clear-coated. The power comes from a Saito 300 engine (swings a 20x12 prop) in front and an O.S. 160 twin engine turning an 18x8 prop in the rear. The Skymaster weighs 41 lb. and is controlled with a JR radio with 13 servos, three battery packs and two onboard glow drivers.



WINNERS		
BEST OF SHOW	Joe Saitta	B-17G Flying Fortress
BEST CIVILIAN	Joe Grable	Cessna 336
BEST MILITARY	Stinger Wallace	B-25 Bomber
BEST SPORT MODEL	Rod Gier	Eagle 105

Spectators packed out the event for all three days, and it was almost like attending a full-size airshow. There was something for everyone, and the club made sure that pilots and the public had a good time. A noontime airshow was a treat for all and included some truly fantastic flying. The highlight—for the kids, at least—must have been Eric Dern flying his red-and-yellow candy-dropping model. Mr. Candy showered the kids with a bomb run of ribbon-trailing Tootsie Rolls. Now that's PR!

The R/C World Flyers and their spouses, contest director Al Sorensen and assistant CD Dixie Cutrone did a great job putting this event together. This year's Festival will be held on November 28 to 30, 1997. If you want more information on the Fall Festival and the R/C World Flyers, call their flying field at (407) 381-9456; someone is always there. Hope to see you there. Until then, keep 'em flying.

Bob Violett flew his show-stopping turbine-powered F-80. To hear the sound of a JPX T-260 in a low pass flyby is awesome. The F-80 is rock solid in the air and handles extremely well on the ground. Bob put on a great demonstration flight with high speed, low passes and vertical climbs—quite a showman.





Eric Dern brought his giant TWA Constellation to the Fall Festival. Don Lowe flew the Connie during the lunchtime airshow break. The Connie has a wingspan of 14 ft. and weighs 42 lb. dry. Four Webra .90 engines power the airliner.

a) Harry Lockwood had a ball flying his pretty 1/3-scale Der Jager D-IX biplane. The Bipe is powered with a Sachs 3.5 glow engine swinging a 22x8 Master Airscrew prop. The model weighs 28 lb. and has a wingspan of 80 in.; finished in bright yellow SuperShrink Coverite and clear-coated with Butyrate dope.

b) Hal Parenti campaigned his Yellow Aircraft P-38 and put on quite a show with the Lightning. The P-38 is very aerobatic, and with Hal at the controls, the various maneuvers appear quite easy to do. The P-38 is powered with two Quadra 42 engines turning 18x8 props with Yellow Aircraft spinners. The model is controlled with an Airtronics Infinity 10-channel R/C system using 14 servos and includes Robart retracts and Yellow Aircraft brakes.

c) Don Lowe, past president of the AMA, did some aerobatic demonstration flights during the halftime airshow.

d) Dave Valdez flew his very pretty BVM Maverick. Dave flew it to the leading edge of its flight envelope. The Maverick is equipped completely with BVM equipment.

e) John Schroder brought a great flying "Big Lazy Ace" scratch-built from Cunningham plans. The model is powered by a Zenoah Z-445 twin, swinging a 22x10 prop. Guided by a Futaba Conquest radio using seven servos, John's Lazy Ace also sports a TME smoke system. The Big Lazy Ace is finished in MonoKote. John Schroder is the son of the late editor of Model Airplane News, Walt Schroder. The apple doesn't fall far from the tree.

f) Rich Feroldi (shown here with son Jack), came with his 1/3-scale Fokker D-VIII scratch built from Ron Wiess plans. The D-VIII is powered with a Zenoah G-62, turning a 22x10 prop. The model has hand-painted lozenge camo that Rich told me was the most tedious part of finishing the model. The model is guided with a Futaba PCM radio using 10 servos and a 1700mAh flight pack. Covered with SuperShrink Coverite, the model is painted with matte finish Full Guard paint.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

HOBBY LOBBY INTERNATIONAL

Eco

A revolution in electric helicopters

by SAM SWIFT

"WHOA! THEY'VE come a long way, baby!" That's all I could say after opening the box for the Ikarus Eco electric helicopter and comparing it with the first attempts at manufacturing electric helicopters several years ago. Distributed in the U.S. by Hobby Lobby Intl.*, the Eco was designed to be the strongest, best flying, easiest to repair 6- to 12-cell electric helicopter to date. This model can use either standard mixing (available on almost all standard helicopter radios) or the CCPM (cyclic/collective pitch mixing) setup that's common in Europe.



PHOTOS BY WALTER SOBAS

ASSEMBLY

The Eco instruction manual is one of the best I've seen in a model aircraft kit. Many parts, e.g., metric hardware, are drawn actual size to reduce confusion. Actual assembly of the Eco begins only after you have decided which mixing system you want to install. If you have access to a heli radio with CCPM capability, you may





SPECIFICATIONS

Main rotor diameter: 1,060mm (41.75 in.)

Length: 960mm (37.8 in.)

Weight: approx. 42 oz. (varies with equipment used)

Batteries req'd: 6 to 12 cells (1400 to 1700mAh)

Radio req'd: 4- to 6-channel

Motor req'd: 8,000 to 24,000rpm

Gear ratios: 12 ratios for motor/main rotor; 3 ratios for tail rotor

Prices: $299 (Eco kit); $89 (sport motor); $99 (power motor); $99 (duration motor); $9 (demonstration video).

Features: lightweight chassis; diagrammed construction manual; versatile choice of power systems.

Comments: the Eco is an easy-to-build, sturdy and stable platform for both beginners and experts.

Hits
- Easy to build.
- Can use standard mixing or CCPM.
- Great performance.
- Replacement and optional parts readily available.

Misses
- None found.

elect this option. If you plan to use an average 5- to 6-channel heli radio, you must choose the mechanical mixing. Hardware is provided to adapt the mechanical mixer even to a 4-channel airplane radio, albeit without all of the special heli functions such as independent throttle/collective, tail-rotor mixing and other subtle features that make heli flying easier.

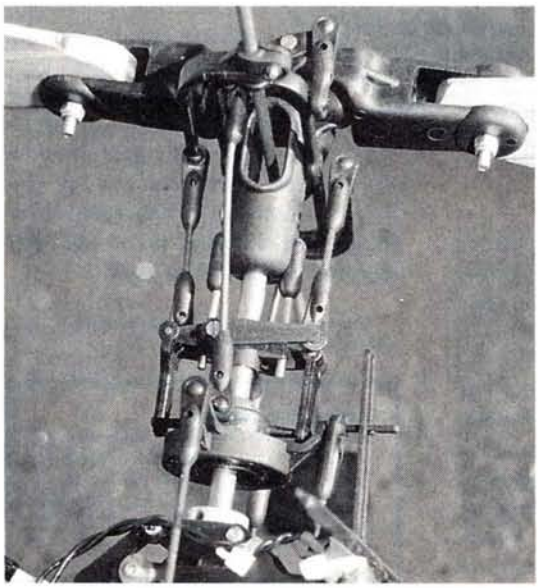
The mechanical mixer consists of a sliding tray with bellcranks contained within the frames for an extremely friction-free, no-slop system. The molded lower tray is assembled first with the plastic main gear, main shaft, upper and lower bearing blocks and tail-rotor pulley attached and then contained within the two glass-reinforced side frames. The mounts for the gyro and receiver are two platforms that are snapped into place on the top forward section of the frames. The glass-reinforced undercarriage is attached to the lower section of the main frame with self-tapping 2x8mm screws.

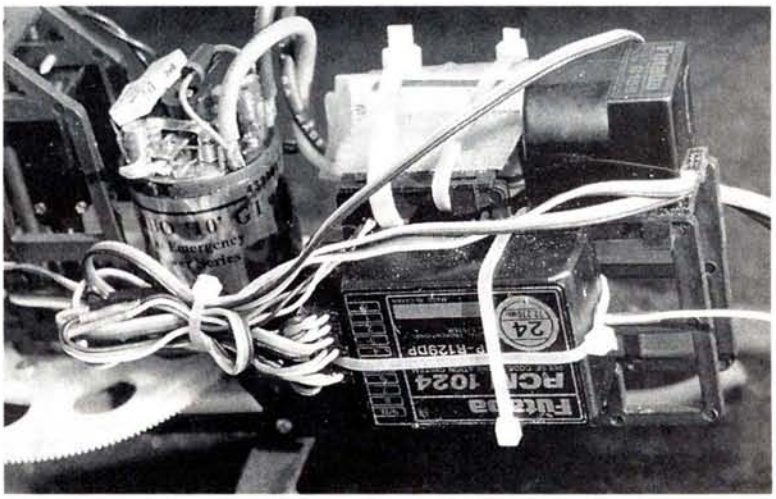
The landing gear is extremely strong and forgiving in all but the most extreme landing incidents. Rubber O-rings on the bottom of the skids hold an 8-cell Ni-Cd and allow quick battery changes.

The construction of the rotor head is next. Attach the center hub, arms with bushings and Y-arms to the pre-assembled, ball-bearing-supported swashplate. The rotor head was designed to withstand the stresses imposed by using 12-cell packs and performing all the hot aerobatics imaginable. It was designed exactly like those of the large .60 glow machines with a ball-bearing-supported blade shaft for extremely friction-free operation. At either end, the flybar has pre-drilled holes that allow you to bolt on the paddles; this eliminates the problem of the flybar paddles getting out of alignment.

After you've attached the completed rotor-head assembly to the main shaft, adjust the pushrods to the correct length using the exact scale drawing in the assembly manual, and attach them from the swashplate to the rotor head. Construction then moves aft to the

The Eco was easier to build than some R/C cars I have assembled. Replacement parts are readily available and are reasonably priced through Hobby Lobby; as seasoned heli flyers will tell you, parts support is important.





Above: the general layout of the Eco's main frame is compact and well-thought-out. The radio installation, gyro, drive motor and main shaft reduction gear are shown here. Left: the rotor head has a four-ball-bearing-supported shaft for extremely friction-free operation.

belt-driven tail rotor. The tail-rotor assembly looks like a shrunken version of the rotor head. Supported by two ball bearings, the tail rotor is also very friction-free and consists of many small parts reminiscent of those in larger, glow-powered machines. Installing the motor is a simple affair. I chose the Hobby Lobby Eco sport motor, as it gives the best combination of endurance and power. It is attached to the frame with two 3x8mm screws. I found that I needed an additional washer between the lower frame and the motor for spacing so that the mounting screws don't interfere with the rotation of the armature inside the motor. It's best to check this by hand before you hook up a Ni-Cd.



Supported by two 2x6x3mm ball bearings, the tail rotor is very friction-free and consists of many small parts reminiscent of larger glow-powered helis.

The pinion is drilled for the standard 3.2mm (1/8-inch) shaft motors and is attached to the motor with a 3x4mm setscrew. Like the tail-rotor belt, the pinion/main gear mesh is important. My method is to take a 3x5 index card and squeeze it between the gears, tighten everything up and then rotate the gears to eject the index card for the correct gear mesh. The aluminum tail boom is attached to the tail-boom supports in the side frames. You must pay careful attention to the belt that drives the tail rotor. The tension must be as close to perfect as possible; if it's too tight, the extra friction will rob the heli of power and slow the entire system down; too loose, and the belt may slip and not turn the tail rotor. Tension is adjusted by sliding the tail boom fore or aft and tightening the four screws that clamp the tail boom within the side frames. The side frames were designed around the Futaba* S-133 and the updated 9201 miniservos.

For the radio installation, the assembly manual has excellent diagrams that will make even an expert applaud. I chose to use the Futaba 6-channel Skysport heli radio with a Futaba MC-114h electronic speed controller and G-155 micro-gyro setup. The tail-rotor pushrod is a length of flexible cable that's tie-wrapped to various portions of the mechanics and gives a friction-free tail rotor system. All other pushrods are 2mm threaded rod connected with high-quality ball links. Mounting the receiver and speed control is relatively straightforward as long as you plan for routing the servo wires. Both are attached to the plastic platforms with 1/8-inch foam tape. After installing the radio, check the servos for proper movement as shown in the manual. The stock wooden main blades are covered with the supplied adhesive-backed plastic film. The clear windshield is trimmed to shape and glued to the inside of the two plastic canopy halves with PFM, RC-56, or equivalent. An attractive decal sheet finishes off the construction process.



FLIGHT PERFORMANCE

Because I was a little nervous about flying such a small, light heli outside in the wind, my first flights were inside a local warehouse; I used from 6- to 10-cell Ni-Cd configurations. Using 6-cell R/C car packs, I was able to hover and maneuver around just out of ground effect. My flight times averaged 3 to 3.5 minutes with 1400mAh packs. Moving up to 8 or 10 cells really makes the Eco perform like an R/C heli should. On 8 cells, the Eco was extremely stable, and after I had adjusted the tracking of the main blades, it was very smooth. Left and right pirouettes proved that the tail rotor is effective and really locks in. Using 1400mAh packs, my flight times averaged 4.5 to 5 minutes. Jumping up to the recommended 1700mAh Ni-Cd bumped the flight times up to 6 to 6.5 minutes. Optimizing the gear ratios would have increased the flight times. Owing to its lightness, the Eco tended to lose momentum in moderate to steep turns. Forward cyclic was needed to keep the forward speed up; otherwise, a high-altitude hover resulted. With the sport motor, I estimate the forward speed at 35 to 40mph. I have yet to try out the aerobatic prowess of the Eco, but after seeing an Eco Ikarus demo video using the power motor, I have no doubt the Eco can climb out and maneuver nearly as well as some hot .30-size glow machines.

Make sure you use a timer for your flights. I learned the hard way that a dead Ni-Cd and the Eco flying along at 30 feet does not make for an enjoyable afternoon. The strength of the Eco really shone, considering that I only broke the landing-gear struts, canopy and the lower portion of the sideframes. The rebuild amounted to approximately one hour and less than $100—a testament to the Eco's excellent design.

CONCLUSION

The Eco was easier to build than some R/C cars I have assembled. Replacement parts are readily available and are reasonably priced through Hobby Lobby; as seasoned heli flyers will tell you, parts support is important. The Eco has proven to be a sturdy and stable platform for beginners and experts. Hobby Lobby also offers many options such as autorotation gear; carbon-fiber side frames; fiberglass main blades; duration, sport and power motors; various gear ratios for the motor and tail rotor; and a beautiful glass-reinforced plastic Jet Ranger fuselage; all allow you to grow with your Eco. If you haven't given electric helicopters a try because you're waiting for one that will actually perform, wait no longer!

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.*

About the author

Sam Swift is an accountant during the week and a full-scale flight instructor on the weekends. He has been in the R/C hobby since age 13. For the past five years, Sam has flown R/C helicopters and been interested in electric flight.



Golden AGE OF R/C

by HAL deBOLT

SO, WHAT'S NEW?

SO, LET'S see what is what this time: Dr. Richard Greenberg of Omaha, NE, informs us that he is a true early bird. He started R/C with a carrier-wave single channel, advanced to tone singles and reed systems and now flies proportional control. He compliments Ace R/C on their former "Grid Leaks" newsletter, which provided helpful info to many modelers who constructed their own equipment. You had to early on! Along the way, Doc has accumulated a collection of OT R/C equipment, and he takes joy in showing today's modelers "how it was done" with an OT single-channel Charger.



George Wilson with his modern version of the Live Wire Champion. He says that it's an outstanding trainer.

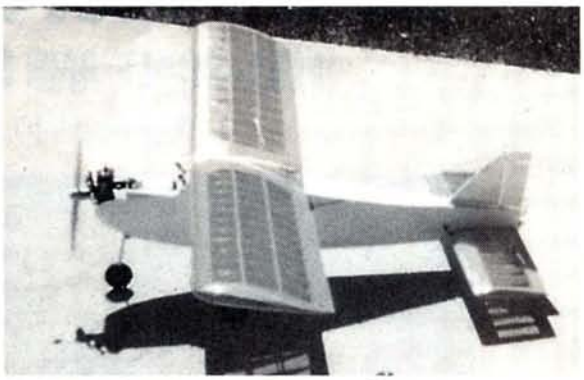
For those not aware, single channel was "it" back then; there were even aerobatic competitions for single-control models. Today, however, we'd call those models "trainer types," as they're not especially maneuverable. A California R/C'er, Boone, saw the shortcoming and developed an aerobatic, rudder-only design called "Charger." He went on to easily win the Nats with it!

Glenn Bolick of Mechanicsville, VA, is another OT'er who wishes he had saved things from his early days. He started in early single-control days with an Ace R/C single tuber and a Lafayette Electronics escapement. Glenn sent a 6½-page Ed Lorenz article that described how to assemble a complete single-control system, transmitter, receiver and escapement!

This system was developed around the robust Sigma 26's relay to ensure reliability. The relay was a major portion of the receiver; we needed one that was smaller and lighter! Glenn also copied a Jaico Products ad for their Gem relay; it proved to be the answer for most relay needs. It was very small, light, adjustable and reliable; it opened the door to rapid receiver development.

Surprising was the response to the Reginald Denny story. Several letters had a theme similar to the one from Gene Hayes of Groveland, CA. As a youngster, Gene lived close to the Denny Hobby Shop. The China Clipper displayed in the window amazed him. After many, many "dream hours" spent in the store, he saved his pennies and finally got a free-flight kit. Inspired, that led to U-control and finally into R/C. His point is that Denny was his "Godfather." He recently passed by the Denny location; like so much else, the freeway had eaten it up! So much for progress.

George Wilson of Marstons Mills, MA, tells us he has seen interest in the Live Wire Champion and feels that building info is needed. He is producing a magazine article on it and provided a photo of his version of the Champ. Over its 30-odd-year kit life, the Champ was offered in three versions. George's is the Mk III version with an upright O.S. 25 engine, reduced dihedral and trike gear. The Champ's training attribute, unlike that of most trainers today, was that it flew itself (à la free flight) if you let the controls alone. George illustrates this by saying his son and 11-year-old grandson both got considerable time on their first outing with the Champ without an instructor.



Dr. Richard Greenberg's replica Boone Charger was an aerobatic, single-channel kit from Ambroid.

Who knows what might linger in that old garage? Roger Hill of Westerville, OH, sent us photos of his treasured swap shop find. He stumbled on an LW Jenny that had been built in 1964 and hung in a garage the last 33 years. One of his first R/Cs was a Jenny, and this one brought back fond memories. Apparently, the silk-and-dope covering survived so well that Roger is able to go back in time by flying the last Jenny in Ohio.

Jim Scarbrough of Lenoir City, TN, checked in to tell us how much he enjoys the "Golden Age of R/C" and with experiences that surely make him an OT R/C'er. Jim and friend Dewey Easton were into free flight and control line when a Walt Good magazine article on pulse control caught their eye. Intrigued, they assembled a receiver from Ace's "Grid Leaks" info and operated it with a secondhand



Bob Charron with his first R/C model. The good-looking original design crashed, was repaired and flew successfully.

SR Because the best radio gear... ...is no better than its batteries!

Most of you have heard of SR Batteries. You've probably even heard that we make great battery packs. However, you've probably *also* heard that our packs are more expensive than the packs from "the other guys."

Well, it's true. We are more expensive... because we're better!

For over 15 years we've made the best custom packs you can buy. We've done it because we're modelers and we want to be proud of what we do. We also want to save you some airplanes.

You're probably not aware that most of SR's business is in the military/aerospace industry. Our customers include NASA, Lockheed, Boeing, the Army, Navy, Marines and Air Force, the Jet Propulsion Laboratory, The Hubble Space Telescope, the Space Shuttle Program, the Mayo Clinic, Johns Hopkins University, AeroVironment, and the Harris Corp. to name just a few.

We're really proud of our newest project. SR was selected as the only company to make the emergency backup battery packs for Northstar's new M3, IFR panel mount GPS for General Aviation.

You're probably wondering why we make packs for the R/C field when we have so much to do for the military/aerospace industry. It's simple. The President of SR Batteries, Larry Sribnick, has been a serious modeler for well over 40 years. To him, your aircraft is no less important than any of the other projects we work on. We try to employ modelers whenever possible and the cardinal rule is, "If we wouldn't feel comfortable about using a pack in one of our own airplanes, we don't let it get out the door!"

OK, it's time for specifics. What does SR do in making a pack that no one else in the R/C field does?

- All SR cells are *screened and matched Aerospace Grade* cells. These are not your usual consumer type inexpensive cells. They are exactly the same cells we use for our military/aerospace applications.
- Only SR *guarantees* its cells and packs not to *ever* form a memory and warranties each pack for one year.
- Only SR puts *every* pack through five days of electronic testing to make sure *every* pack is perfect. These tests include a test of capacity, charge retention, and a vibration test for mechanical integrity.
- All *welded* internal and external construction. Would you believe that some companies sell cells where the internal connections are nothing more than a press fit? We don't even have soldered connections, except for the connector leads themselves.
- Even the straps we weld from one cell to another are an SR exclusive. Each strap is strain relieved so that no vibration or stress is transmitted to the welds at the end of each cell. No one else has this feature!
- All SR packs can be fast charged. Of course no cell will stand up to extreme overcharging but all SR cells have the lowest possible internal impedance so that fast charging isn't a problem.
- All SR packs give you more flying time with less size and weight. Our packs are continually growing in capacity while shrinking in size and weight. Our 1000 Series receiver pack, for instance, is smaller and lighter than the standard 500mah pack that comes with many new radio systems, but it has twice the capacity and flying time.
- No other company gives you the range of receiver and transmitter packs that we do. We never have to try to "fit a round peg into a square hole" because we don't make a particular size cell. Our cells range from 50mah to 10,000mah in capacity.
- Custom packs. Now, that's what we're all about. While other companies force you to buy what they make, we sell you what you want. A 5 cell pack rather than a 4 cell pack? No problem! 36" leads on the pack? No problem! A special shape pack? No problem! A JR and Futaba connector on the same pack? No problem. You name it, we'll do it. And, normally, at no extra cost!
- Did you ever try calling the "other guys" with a technical question? Did anyone there have any idea of what you were talking about? Only SR maintains a *Hotline* phone number, 516-286-0079, where you can call for help with *any* R/C problem or question, battery related or not!

Using SR packs, thousands of contests have been won, national and world records set, and national championships awarded to modelers around the world. A short list of just some of our customers would include: Bob Aberle, Joe Bridi, Dave Brown, Byron Originals, Hal DeBolt, Bob Dodgson, Dr. Walt Good, Robert Gorham, Dick Kidd, Ivan Kristensen, Don Lowe, Eloy Marez, George Myers, Dean Pappas, Dave Platt, Nick Ziroli, etc., etc.!

If you'd like more information or have a question, drop us a note at SR Batteries, Inc., Box 287, Bellport, NY 11713, Fax: 516-286-0901, Email: 74167.751@compuserve.com or call 516-286-0079 between 9am and 5pm Monday through Friday, Eastern Standard Time.

-ADVERTISEMENT-

THE RECORD MAN

Maynard Hill of Silver Spring, MD, has a passion for R/C records and has pushed them higher and higher for many years. Recently, Maynard's friend Jim Clem out in California established a new distance record by a substantial amount. Would you believe that in a short time, Maynard just had to go out and raise the record by a considerable amount!? No mean feat. Atta boys to both of them!

The effort and extent Maynard has gone to with very specialized equipment of his own design is amazing. Imagine, for example, flying day and night for over 30 hours!

His high-altitude record, however, appears to have been more a happenchance than a prepared effort. How it happened is unusual and interesting.

Maynard developed a 12-foot, 6½-pound glider especially for the attempt. When a means of recording altitude was needed, a special barograph was also produced. With no attempt date established, Maynard took the glider with him on his trip to a Glenview Nats.

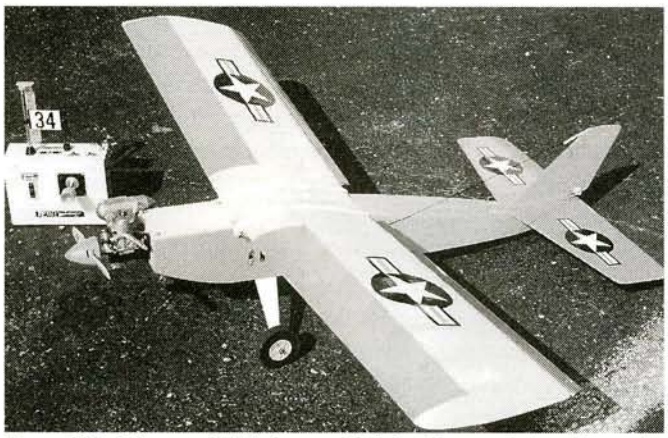
At the Nats, his friend Dale Willoughby suggested they take a side trip to the FAI free-flight team trials at Bong Field. On their arrival, they noted the glorious thermal weather and felt it should not be wasted. Dale high-started his Kurwi contest glider, and it was quickly sky-high in a thermal. Maynard got his big glider and winched it to about 600 feet, which proved too low to enter the strong thermals Dale had found. The answer was to tow the monster with the car, which provided plenty of power to get the required height! It worked, so an official attempt was organized. Dale took his Kurwi up first and located the thermal area. Once noted, Maynard got sufficient altitude with the car tow but was in a downdraft; luckily, he got out of it and into the thermal along with Dale. The big one soon rose past the Kurwi and quickly became a speck against dark clouds that had moved in. With a storm evident, they decided they had exceeded the established Russian record. Prudence prevailed, and the glider was brought down to a landing within 150 feet of the launch point. The barograph showed 3,770 feet—a new record!



Dale Willoughby congratulates Maynard Hill on his 3,770-foot world altitude glider record at Bong Field in 1966.

What happenchance? 1. Taking the glider to Glenview. 2. A spur-of-the-moment trip to Bong Field. 3. FAI officials available. 4. Willoughby's unplanned thermal searching. 5. The car tow worked. I doubt that things ever fell together so neatly with any of the master's other attempts!

C-S transmitter. Wanting Galloping Ghost, they put together a transmitter pulser and felt their efforts were usable. They installed the works in a Berkeley "Sea Cat" Dewey had been flying free-flight. After the hassle of sorting out the rudder/elevator linkage, it was ready for flight. As was so rare, these embryonic R/C'ers had control, flew the fuel out and made a fine deadstick landing! They were hooked and went on through various other pulse systems culminating with a *Model Airplane News* 2-3-4 propo that you assembled from a kit. They used the 2-3-4 in many planes with no radio problems. Jim still has the propo in operating condition! So another R/C'er was born and remains active today.



Roger Hill's 34-year-old LW Jenny, which he flies regularly with an old, reliable, single-stick Pro-Line. He says it's the last Jenny in Ohio!

In the past, we mentioned that Bob Charron of Lynn, MA, had a first R/C model of his own design. Apparently, it crashed (not unusual in early days), and now Bob suggests that he was not discouraged and obviously went on and is still active today. As any accomplished modeler has learned, crashes are inevitable; the true modeler is one who repairs and goes on to fly another day! Bob has been through the mill with his design efforts, commencing in control line with Dynajet speed, team racers, sport and aerobatics. He also had some glider endeavors, and, obviously, an occasional crash just inspired him to try again. Point might be that occasional problems only add to the expectancy and flavor of our great sport!

Bob has also seen fit to attract youngsters to model aviation. He has made a serious effort with cute gliders assembled from paper and Popsicle sticks. Because they're easily and quickly assembled, even a youngster with no experience can feel the thrill of flight accomplished with his own hands! I should add that a surprise package brought two lovely paper biplanes from Bob. Like jewels, they were so beautiful you hated to even touch them—obviously, the result of extensive effort! Currently, Bob Charron is into giant-scale with a Fairchild 24, a Rearwin Speedster and a J-3 Cub. You just can't keep an OT R/C'er down!

Do remember that this is your OT R/C place; early photos, catalogues, magazine articles and experiences are of interest and enjoyed by all!



Effective PROGRAMMING

by DON EDBERG

DO YOU NEED A COMPUTER RADIO?

HELLO! I am Don Edberg, the author of this new column on computer radios. I thought you might be interested in my background before I get started. I've been flying radio-control stuff for about 26 years. I fly sailplanes, electrics, helicopters and some oddball stuff like CO_2-powered R/C and such. I've been on three world championship teams, twice as a pilot and once as a team manager, all in class F3B multi-task sailplanes.

I have published a few hobby-related books of my own. I have just completed a new book of probable interest to the readers of this article entitled "Guide to Computer RC Systems" (info at end of article). Also, I published a book called "Programming the Futaba Super 7 for Aircraft and Sailplanes," and I've been writing the "Soaring" column in *RC Modeler* magazine for eight years.

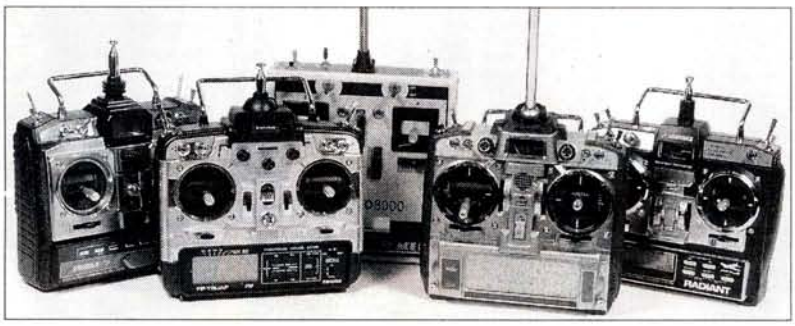
In real life, I am a scientist at McDonnell Douglas Aerospace (soon to be swallowed up by the Boeing Co.) in Huntington Beach, CA, working for an organization called the Phantom Works on ways to reduce shock, vibration and noise loads on spacecraft, on launch and in orbit, as well as some other special projects. I guess that this means I am a "rocket scientist," but you can be sure that the material I write will be understandable to all.

If you find there's a particular topic that you'd like more information on, or you are looking for answers to how to handle a certain programming problem, drop a note or email, and I'll either answer it privately or will include it in a future article!

WHY YOU MIGHT NOT NEED A COMPUTER RADIO

I've been fortunate to be able to travel to and attend many hobby trade shows on the way to or from business appointments, and a question that commonly comes up from show attendees is, "Why do I need a computer radio?"

Well, the honest answer is you don't. Sure, you can live without them and do just fine. For regular sport models, there's no need for one. You can manage it OK and never miss out.



But I like to use the comparison to the radios you find in automobiles for listening to news or music. For a long time, all car radios were tuned only by turning the dial. You turned the dial until you got to the station you wanted to hear (if you could get it). For another station, you turned the knob again. No problem, right? You can manage that.

Now, automobile radios (should I call them sound systems?) have push-button tuning. You set each push-button for a favorite station, and then you can find different stations almost instantly with a single touch. Once you have a radio like this in your car, you wonder how you managed to keep your sanity while turning the knob on your older car's radio.

Well, computer radios are sort of the same thing. You don't *really* need one, but once you have one, it saves you so many hassles and makes setting up models and flying them *so* much easier that you'll wonder how you managed without one. Here are a few examples.

Suppose you have more than one model. If you didn't have a computer radio, you'd either need to buy a second R/C system or flight pack, or, if you used the existing one, you'd have to make sure that the trims and control throws and travels were properly set for the second model before you flew, since no two airplanes are exactly the same. With a computer radio to store trims and settings for both, you can move back and forth between the two models without having to worry about your trims being changed, since the radio can be made to "remember" where the trims were for each model.

Some of the more advanced radios offer the ability to store subtle differences in control functions for a single model in two different memory storage locations. It's like going to the eye doctor who asks, "Is the first better or the second?" You might use this method to sort out dual rates, snap-roll settings and for dialing in exponential settings. Once you've decided which memory selection contains the preferred settings, you can either erase (reset to defaults) the other memory selections or retain them for future use.

You might have a model whose flight characteristics leave a bit to be desired. For example, suppose that your model flies straight ahead at high throttle but requires rudder inputs at lower throttle settings such as on landing approach. You can use a programmable mixer to feed in rudder as the throttle is moved, so you don't need to worry about compensating; the radio does it for you. Or for an aerobatic model, you find that the model pitches up or down during knife-edge flight. You can fix this with a mixer, too. Maybe you want a different set of trims and control movements for calm and windy conditions, or you want to automatically go to high rates on ailerons whenever your model's flaps are down. All of these ideas—and countless more—are possible with a computer radio.

If you fly choppers, you may get into a situation in which you want the gyro to be automatically disabled dur-

ing aerobatics. A computer radio can handle these functions and many other interactions so typical of choppers.

A sailplane pilot wants to have launch flaps that droop, with down-elevator commanded to maintain pitch trim. The launch function is accomplished by presets, commonly found on computer radios. You can make steep precision approaches by raising your model's ailerons while dropping its flaps, a function called "butterfly" by Futaba* and JR* and "crow" by Airtronics*.

All of these things, and many more, can be handled by some computer radios. In fact, you can set up some things that you wouldn't believe! In my articles, you'll learn how computer radios can be programmed to carry out all these features.

If you already have a computer radio, your best bet is to keep a spare memory available to try things out. You may find it much easier to see the effects of your programming actions when something actually happens the instant you change a setting. This means hooking up servos to a receiver and going for it! Don't be afraid to make a mistake; you can always get back to where you were, or you can totally reset things if you *really* screw up. If you want, you can duplicate the settings you want to preserve in another memory so that you can recall them if necessary.

BEGINNER VS. ADVANCED SYSTEMS

It's worth noting that there are three levels of radios available: the basic or beginner units ($), the three-in-one radios ($$) and the top-o'-the-line ($$$) systems. Beginner units, like Airtronics' Radiant, Futaba's T6XA/XH, Hitec's* Flash and JR's 622, have two- or three-model memories and a set of basic functions. They are typically priced below U.S. $250. They may—or may not—contain programming and special functions for both fixed-wing models and choppers, and currently, none has sailplane-specific functions, though many may be used for sailplanes.

Before purchasing, be sure that the system you are considering has all of the functions you need. To do this, you may wish to request a copy of the system's manual from its manufacturer, or you may ask the flyers in your local model club for their opinion. Another option is a chart that compares the functions available in many computer systems sold today. This "Radio Comparison Chart" is available for U.S. $5 postpaid from the same source as the radio programming guidebook mentioned above.

The three-in-one systems, so called because they contain programming for fixed wing, helicopters and sailplanes, are probably the best buy because they allow a serious modeler to move up to more complex models without an additional investment in a new radio. The three-in-one radios include the Airtronics Stylus, Futaba's System 8, Hitec's Prism and JR's X-347, X388S, XP783 and 8103, and typically have from four- to eight-model memories and more extensive sets of functions and adjustments. If you can afford to spend more, you're better off getting one of these more versatile systems. They're more flexible in setting up, and if you continue to fly R/C, you'll be glad you spent the extra cash.

The top-o'-the-line systems may be three-in-one systems or may not. Examples are the Airtronics Infinity 1000, Futaba's 9Z and JR's PCM-10 series (the Airtronics Stylus may come into this category if you include the optional memory and model program cards). These systems typically have eight or more model memories and very powerful, sometimes complicated to use, sets of functions and adjustments, along with a larger display screen. Their flexibility also makes them more complicated to use. It's sort of like buying a desktop computer: you want to buy the most powerful system you can so that later, you can use that power.

There have been some special-use radios, many of which are discontinued but still may be found in swap meets and make perfectly good systems for beginners. Airtronics sold the Vision system in separate pattern (8P) and sailplane (8SP) versions. JR sold the PCM10, 10S and 10SX, and a few years back, Futaba sold the 9V, all of which had separate helicopter and fixed-wing versions. Futaba's Super 7 had separate acro/heli (7UA/7UH) and acro/glider (7UG) versions. If you wanted the features of both, you had to buy a second system!

You may be wondering what the differences are between helicopter and fixed-wing systems. Usually, the only differences between them are the locations of some of the switches, and the throttle stick typically has the "ratchet" or detents removed on the helicopter versions simply because it's easier to hover with a smooth throttle stick. Helicopter systems also typically are shipped with five higher-quality servos (compared to four regular servos) and a battery pack of higher capacity than the fixed-wing versions; this accounts for their higher prices.

You can write to me at 4922-2E Rochelle Ave., Irvine, CA 92604-2941, or contact me via email at don_edberg@compuserve.com. If you enclose a self-addressed, stamped envelope, you'll have a much better chance of a prompt reply. I try to answer all mail, but sometimes, it takes a while, so please be patient.

[Editor's note: you can also write to Don for a copy of his "Guide to Computer Radio Control Systems" book (U.S. $19; $29 foreign) and/or his computer radio chart (U.S. $5; $6 foreign).]

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.*

Do You Really Need A Computer Radio?

You should not consider a computer radio if ...

- You only have one model
- You can't afford the $225 (or more) for one
- You have a simple, 4-channel model with no special features
- Your model always does *exactly* what you want when you control it
- You don't mind keeping track of different trim positions, travel directions and throws for different models
- You are perfectly happy with the built-in functions of your R/C system

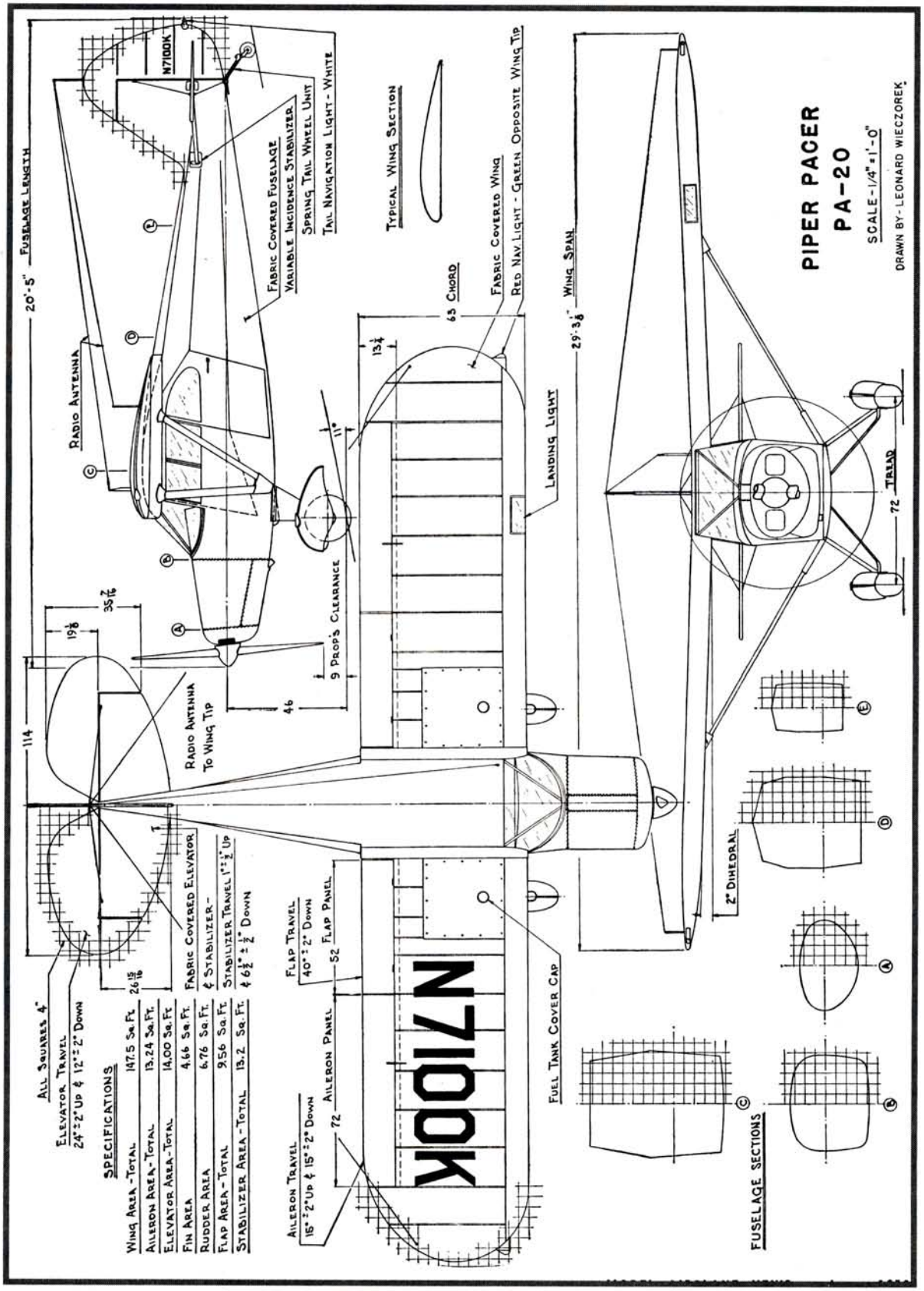
You should consider a computer radio if ...

- You have two or more models, especially different types of models
- You don't mind spending a bit more to get a giant benefit in the long run
- You have a pattern, scale, twin, fun-fly, high-performance sailplane, or chopper
- Your model could use a little correction in some maneuvers
- You don't want to worry about different models' trim positions, travel directions and servo throws
- You'd rather "tinker" a bit with different functions to get the system to work best for your application

Planes Worth Modeling

3-View Documentation for Scale Modelers

Piper PA-20 Pacer



J-3

Piper Cubs can be found at just about every model flying field in the world. But following WW II, Piper produced a series of high-wing monoplanes that would serve as ideal modeling projects. The Piper PA-20 Pacer is one example. With nearly twice the horsepower of a J-3, its Lycoming 0-235-C1 engine pulled it along at 108mph.

SPECIFICATIONS

Wingspan—29 ft., 3⅛ in.	**Wing area**—147.5 sq. ft.
Length—20 ft., 5 in.	**Weight (loaded)**—1,650 to 1,750 lb.

LATEST PRODUCT RELEASES



STERLING MODELS

P-47D Thunderbolt

This 22-inch-span, 18½-inch-long rubber-powered model kit includes die-cut balsa parts, clean balsa strip stock, Crystal tissue covering, vacuum-formed cowl and canopy, decals and a rubber-powered motor. It also comes with a full-size plan and building instructions.

Price—$20.99.

Sterling Models; distributed by Estes Industries, P.O. Box 227, 1295 H St., Penrose, CO 81240; (719) 372-6565; fax (719) 372-3419.



WINDSOR PROPELLER CO.

13 New Propellers

Master Airscrew G/F Series propellers in 7x3, 7x5, 8x3, 8x5, 8x7, 9x7, 10x4, 10x5, 10x9, 11x4, 11x5, 11x8 and 11x10 sizes are now available. CNC-designed and tooled, these props have NASA airfoils, true helical pitch and accurate balance. They're made of glass-filled nylon and feature hub fillets for blade strength. For a free brochure, send an SASE to Windsor Propeller.

Windsor Propeller Co. Inc., 3219 Monier Cir., Rancho Cordova, CA 95742; email 72673.110@compuserve.com.



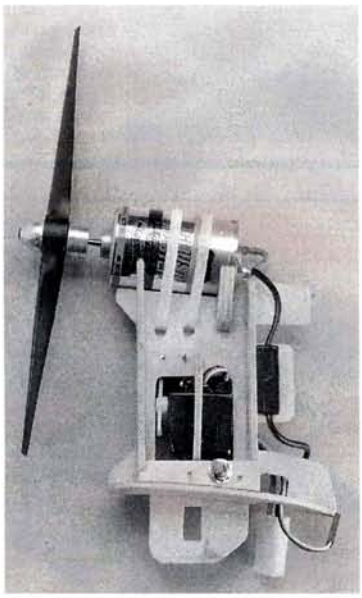
PREMIER DISTRIBUTORS

Smokin' 40

This kit features an all-epoxy/glass fuselage, cowl, hatch cover and wingtips, and balsa fins and elevons and comes with instructions and full-size plans. The model will fly at 200mph and can be hand-launched. Specifications: wingspan—36 inches; wing area—575 square inches; weight—3 to 4 pounds; engine recommended—.40 to .50.

Price—$129 plus S&H.

Premier Distributors, 620 CR 324, Moulton, AL 35650; (205) 974-1307.



GREAT PLANES

Power Pod

Constructed of lightweight ABS plastic with a plywood underframe, the Power Pod provides lifting power for R/C sailplanes. It comes with a Great Planes Thrustmaster 550 electric motor, motor switch harness, spinner and propeller. The pod assembly can be integrated with the sailplane's wing joiner or attached with rubber bands.

Part nos.—GPMG0800 (power pod w/motor), GPMG0805 (unpowered power pod); **prices**—$49.99, $13.99.

Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008.



CUTTING EDGE ENTERPRISES

Hand-Portable Power

The 9-pound Powerport 149 measures 4x4.5x6 inches and provides 140 watts of 115V AC and up to 20 amps of 12V DC power. It can be charged in your vehicle via a cigarette lighter and is equipped with a fully automatic wall charger that can be left plugged in without overcharging your battery. Flexible solar panels are also available.

Cutting Edge Enterprises, 1803 Mission St., Ste. 546, Santa Cruz, CA 95060; (800) 206-0115.

Product NEWS



TOWER HOBBIES

System 3000™ 4FM Radio

This 4-channel FM radio features a narrow-band receiver (made with SMT components) and a transmitter with a strong, reliable signal. It comes with all Ni-Cds, all-channel servo-reversing, Futaba-compatible J plugs, proportional trims on all channels and a retractable, screw-on antenna. The 4FM comes in six setups, each designed for a specific application.

Price—starts at $99.99.

Tower Hobbies, P.O. Box 778, Champaign, IL 61820; (217) 398-1100.



D&L DESIGNS

CAP 231EX/232

Plans and a wood pack for this 1/3-sport-scale model are now available. The design features a midship fuel-tank position, pull/pull cable rudder, spanwise variable airfoil design for excellent low-speed handling and a removable tailwheel assembly. Specifications: wingspan—77 inches; wing area—1,102 square inches; engine required—.25 to .35cc glow or 1.4 to 2.0 4-stroke; weight—13 to 14 pounds.

Prices—$25 (3 sheets of plans), $59.50 (wood pack).

D&L Designs, 1145 E. Kleindale Rd., Tucson, AZ 58719; (520) 887-0771.



LANIER RC INC.

The Shrike

This balsa kit can be built quickly and is perfect for sport or combat flying. The kit features CAD plans, laser-cut, interlocking fuselage construction, tabbed rib construction, fully symmetrical airfoil, vacuum-formed canopy and building instructions. Specifications: length—26.5 inches; wingspan—35.5 inches; wing area—329 square inches; recommended engine—.10 to .15 2-stroke; channels—3; weight—28 to 32 ounces.

Lanier RC Inc., P.O. Box 458, Oakwood, GA 30566; (770) 532-6401.



LESHER MODEL AVIATION

Ducted-Fan Accessories

Designed for use with the O.S. .91 VDRF engine, the Performance Tuned Pipe is made of steel and weighs only 156g. The O.S. Manifold Adapter Kit is for use with the Performance Pipe and fits onto the standard O.S. .91's exhaust manifold to protect the front of the tuned pipe.

Lesher's Performance Anti-Vibration Mounts protect the airframe and other model components from stress and damage. They were designed for use with the Ramtec fan unit but can also be used with most other ducted-fan units.

Prices—$115 (Performance Pipe), $9 (Manifold Adapter), $18 (Anti-Vibration Mounts).

Lesher Model Aviation, 330 Rexmont Rd., Lebanon, PA 17042-8445; (717) 272-2616; fax (717) 272-0481.



FUNAERO R/C

RAF SE5a

This IMAA-legal, 60-inch-span short kit includes CAD plans, instruction manual, laser-cut formers, bulkheads, pre-bent landing gear and cabane wire and balsa and plywood parts and other miscellaneous materials. You need provide only the control hardware and some sheeting and sticks.

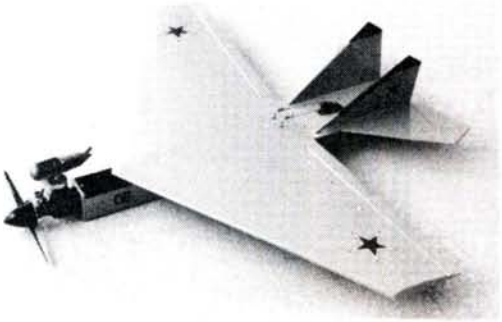
Price—$109.95 (short kit, plus $5.50 S&H); $20 (plans, instructions and material list, plus $4.50 S&H).

FunAero R/C, 212 Butterfly Ct., Orangeburg, SC 29118; (803) 533-0540.

Descriptions of products appearing in these pages were derived from press releases supplied by their manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News,** nor does it guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News.** Manufacturers! To have your products featured here, address the press releases to **Model Airplane News,** attention: Product News, Air Age Inc.,100 East Ridge, Ridgefield, CT 06877-4606.

New From LDM Industries!

MiG-25 "Foxbat"



Length 38 In.
Wingspan 43-1/2 In.
Wing Area 500 Sq. In.
Weight 4 to 4-1/2 Lbs.

LDM Industries introduces the newest member of the Combat Fighter Series, the MiG-25 "Foxbat". All five of the Combat Fighter Series aircraft use a .40 to .46 engine and a 4 channel radio. These kits feature foam core wings, balsa tail surfaces, an extensive hardware pack, and a rugged PVC fuselage. The simple modular construction allows these planes to be built in only 8-10 hours.

Our Combat Fighter Series Video is now available for $7.95. When ordered with a kit, the video is only $5.00!

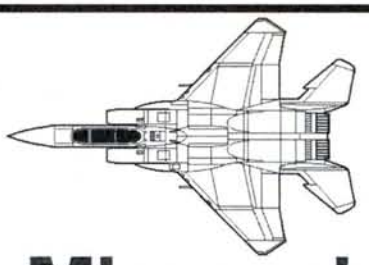
Also Available:

A-10 "Warthog" Kit #4010
F-15 "Eagle" Kit #4015
F-16 "Falcon" Kit #4016
F-18 "Hornet" Kit #4018

Send check or money order for $44.95, plus $5.00 S&H per kit, to:

LDM Industries, Inc.
P.O. Box 292396
Tampa, FL 33687-2396
Phone (813) 991-4277
Fax (813) 991-4810

Florida residents add 6% sales tax.
VISA and MASTER CARD Accepted



Miss one! MISS OUT!

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Subscribe:
1-800-827-0323

INDEX OF MANUFACTURERS

Airtronics, 15311 Barranca Pky., Irvine, CA 92718; (714) 727-1474; fax (714) 727-1962.

Airworks, 334 Haroldson Dr., Corpus Christi, TX 78412; email: freder@aol.com; website: http://members.aol.com/AirworksRC.

AstroFlight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292; (310) 821-6242; fax (310) 822-6637.

Blue Feather Entertainment, 3105 Yukon Dr., Modesto, CA 95350; (800) 725-6967.

Bob Sliff's Models, P.O. Box 9, Midway City, CA 92655; phone/fax (714) 893-2337; email: BSLI40@aol.com.

Bob Violett Models (BVM), 170 State Rd. 419, Winter Springs, FL 32708; (407) 327-6333.

CAB Designs, website: http://www.netads.com/com/cabdesigns; email: cabdesigns@aol.com

Chip Vignolini, 1305 Perry Ave., Morgantown, WV 26505; (304) 598-9506; email: ydne30a@prodigy.com.

Cirrus Ventures, 115 Hunter Ave., Fanwood, NJ 07023-1030; (908) 322-7221.

Coverite; distributed by Great Planes Model Distributors (see address below).

CR Aircraft Models, 205 Camille Way, Vista, CA 92083; (619) 630-8775.

Culpepper Models, 424 West Locust, Dubuque, IA 52001; (319) 582-0029.

David Layne Designs, 1808 Applegate Dr., Modesto, CA 95350; (209) 529-8457.

DJ Aerotech, 719 Fisk St., Piqua, OH 45356; (937) 773-6772; fax (937) 773-9494; email: djwerks@bright.net or DJaerotec@aol.com; website: http://www.bright.net/~djwerks/.

Dodgson Designs, 21230 Damson Rd., Bothel, WA 98021; 206 776-8067; email: dodgsonb@eskimo.com; website: http://www.eskimo.com/~dodgsonb/.

Don Peters, Maple Leaf Design, 2015 Carquinez Ave., El Cerrito, CA 94530; (510) 234-8500; email: mapleaf@aimnet.com.

Dream Catcher Hobby Inc., P.O. Box 77, Bristol, IN 46507; (219) 848-1427; email: dchobby@skyenet.net.

Du-Bro Products, P.O. Box 815, Wauconda, IL 60084; phone/fax (815) 455-9280.

E-Z Lam; distributed by Aerospace Composite Products, 14210 Doolittle Dr., San Leandro, CA 94577; (510) 352-2022; fax (510) 352-2021.

Fox Models (or NSP), 115 N. Thornwood, Davenport, IA 52802; (319) 322-1244; email: foxsoar@aol.com.

Futaba Corp. of America, P.O. Box 19767, Irvine, CA 92723-9767; (714) 455-9888; fax (714) 455-9899.

Gerard Enterprises Inc., W226 N825 Eastmound Dr., Waukesha, WI 53186; (414) 521-0547; fax (414) 521-0551.

Great Planes Model Distributors, 2904 Research Rd., P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104; website: http://www.hobbies.net/dynaflite.

Hitec/RCD Inc., 10729 Wheatlands Ave., Ste. C, Santee, CA 92071-2854; (619) 258-4940; fax (619) 449-1002.

Hobbico/Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948.

Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948; email: 74164.2423@compuserve.com; website: http://www.hobby-lobby.com.

Hobbypoxy, 36 Pine St., Rockaway, NJ 07866; (201) 625-3100; fax (201) 625-8303.

Ikon N'west, P.O. Box 306, Post Falls, ID 83854; (208) 773-9001.

Jet Hangar Hobbies, 10595 Bloomfield Ave., Los Alamitos, CA 90720; (310) 493-1285; fax (310) 493-1765.

Joe Galletti, The Torque and Recoil Club, 7004 Chinook, Austin, TX 78736; (512) 454-0061; fax (512) 301-1782; email: FOAMERON@aol.com.

JR Remote Control; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; fax (217) 355-8734.

K&A Models Unlimited, 9300 Yvonne Marie Dr. NW, Albuquerque, NM 87120; (505) 890-7549; fax (505) 890-7532.

K&B Mfg., 1520 B Corona Dr., Lake Havasu City, AZ 86403; (520) 855-7901; (520) 855-5930.

Klotz Special Formula, P.O. Box 11343, Fort Wayne, IN 46857.

McBurnett Productions, 7506 Legend Point Dr., San Antonio, TX 78244; (210) 662-9503; email: supermac@txdirect.net; website: http://www.txdirect.net/~supermac.

Midwest Products, P.O. Box 564, Hobart, IN 46342-0564; (800) 348-3497.

Model Graphics, 121 Cove Rd., Hemphill, TX 75948.

MonoKote; distributed by Great Planes Model Distributors (see address above).

MM Glider Tech, P.O. Box 39098, Downey, CA 90259; (310) 923-2414.

North American Power R/C, P.O. Box 92638, Southlake, TX 76092; (817) 251-0787; fax (817) 251-0547.

Northeast Sailplane Products, 16 Kirby Ln., Williston, VT 05495 (802) 658-9482; email salnsp@together.com; website: http://www.nesail.com.

Oracover; distributed by Hobby Lobby Int'l (see address above).

O.S.; distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.

Pacer Technology, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

Perfect Paint; distributed by Chevron Hobby Products, P.O. Box 2480, Sandusky, OH 44870.

Performance Specialties, P.O. Box 3146, Gardnerville, NV 89410; (702) 265-7523; fax (702) 265-7522.

Proctor Enterprises, 25450 N.E. Eilers Rd., Aurora, OR 97002; (503) 678-1300; fax (503) 678-1342.

Quadra-Aerrow Inc., P.O. Box 183, 1881 Rogers Rd., Perth, Ontario, Canada K7H 3E3.

R/C Direct, 2323-C Tamara Ln., San Marcos, CA 92069; (619) 752-9330; email: berg@rc-direct.com.

Robart Mfg., P.O. Box 1247, 625 N. 12th St., St. Charles, IL 60174; (708) 584-7616; fax (708) 584-3712.

Sanyo, 2001 Sanyo Ave., San Diego, CA 92173; (619) 661-6620; fax (619) 661-6743.

Sig Mfg. Co. Inc., 401 S. Front St., Montezuma, IA 50171; (800) 247-5008 (order only); fax (515) 623-3922.

Specked Soaring Equipment, P.O. Box 734, Lapwai, ID 83540; (208) 843-5564.

Sky Bench Aerotech, P.O. Box 316, Washington, MI 48094-0316.

Skytech Aviation; distributed by North American Power R/C (see address above).

Slegers Intl., Rt 15. Wharton, NJ 07885; (201) 366-2525; fax (201) 366-0549.

Slimline Mfg., P.O. Box 3295, Scottsdale, AZ 85271; (602) 967-5053; fax (602) 967-5030.

Soaring Specialties, 1403 Lincolnshire Rd., Oklahoma City, OK 73159; (405) 692-1222; email: geovoss@ou.edu.

Stan's Fiber Tech, 8901 Haskell St., Riverside, CA 95203; (909) 352-4758.

Take Flight Model & Mold Inc., 5350 McIntosh Point, Ste. 120, Sanford, FL 32773; (407) 328-8124.

Top Flite; distributed by Great Planes Model Distributors (see address above).

Tru-Turn, P.O. Box 836, South Houston, TX 77587; (713) 943-1867.

Usher Enterprises, 9810 NW Gordon Rd., Cornelius, OR 97113.

Vailly Aviation, 18 Oakdale Ave., Farmingville, NY 11738; After 6:30 p.m. EST (516) 732-4715.

Ward Graphics, P.O. Box 2271, Meriden, CT 06450; (203) 630-1943.

Weston Aerodesign, 944 Placid Ct., Arnold, MD 21012; (410) 974-0968; email: waco@ari.net; website: http://www2.ari.net:80/home/waco.

West Systems; distributed by Composite Structure Technology, P.O. Box 642, Tehachapi, CA 93581-0642; (805) 822-4162; (805) 822-4162.

Wilkerson Performance Aircraft, 1497 Krameria St., Denver, CO 80224.

Williams Brothers, 181 Pawnee Street, San Marcos, CA 92069.

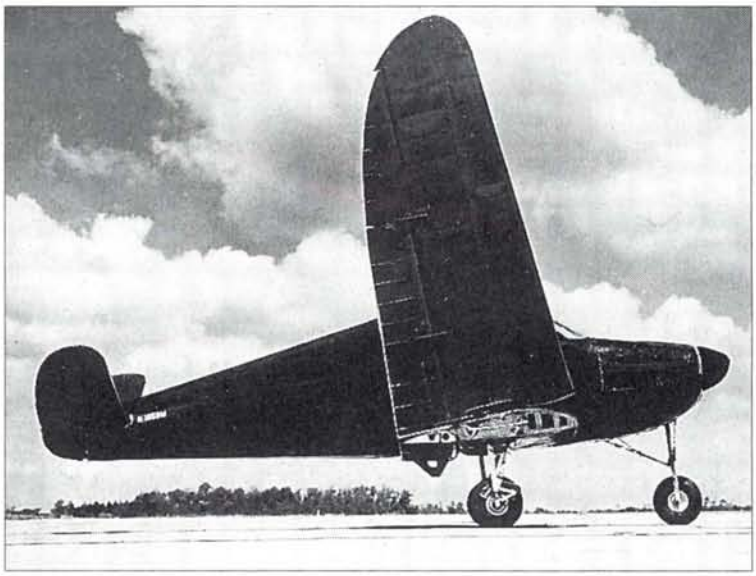
Zap Glue, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

Zinger; distributed by J&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710.

Name THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606.



Congratulations to Glenn Tussing of Edwards Air Force Base, CA, for correctly identifying the March '97 mystery plane. First flown in 1951, the Chase Aircraft Co. XC-123A was America's first jet-powered troop- and cargo-carrying transport plane. This plane has an interesting history: originally designed by Russian émigré Michael Stroukoff in 1947 as an 86-foot-span, 53-foot-long military assault glider, the airframe design was later outfitted with conventional propellers and finally with the four General Electric F-47 turbojet engines—rated at 5,200 pounds of thrust each—shown in the photo.

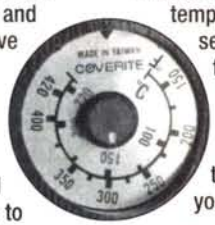


The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

The covering iron that makes all others obsolete

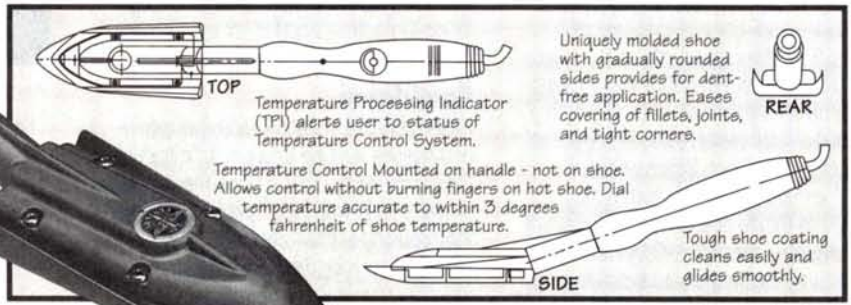
This sealing iron eliminates guesswork! All major iron-on covering manufacturers recommend specific application and shrinking temperatures to achieve the tightest and longest-lasting possible finish.

Only the **21st Century Iron** has a built-in temperature control system accurate to within three degrees Fahrenheit of the dial setting! Simply set the dial to the desired temperature. The Temperature Processing Indicator (TPI) lights as the iron temperature rises to reach the dial setting. The TPI blinks when the set temperature is reached, telling you it's time to cover! No thermometer or complicated testing needed — this advanced tool is the only iron which allows you to dial a specific temperature.



The **21st Century Iron** has been designed from the ground up by master modelers. Its unique shoe design will reach into places other irons can only dream of, and its fully contoured shape allows for dent-free application. The temperature control dial is on the handle, not on the hot shoe — *no more burned fingers!* Its specially formulated coating delivers remarkable slip characteristics for the smoothest, no-drag slide over virtually any covering surface. A custom-fitted covering sock and a sturdy table-top stand are included free. It costs a little more than conventional irons, but it's the last iron you'll ever buy. *The "smart" iron — only from Coverite.*

For the location of the Coverite dealer nearest you, please call **1-800-682-8948**, and mention code **#0213L**.



21st CENTURY™

COVERITE™

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P.O. Box 9021, Champaign, IL 61826-9021

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A few serious scale fans might insist that a model of a Cessna should always be flown just like the real thing. Slow. Rock solid. Smooth. With conservatively banked turns and graceful, nose-high, slow-as-a-walk main-gear touchdowns.

Fine.

And when you feel like it, that's exactly what you'll be able to do with your super-stable, slick-looking, all balsa and ply, pre-built and covered Hangar 9 Cessna ARF.

But when those scale fans aren't looking, yeeee-hah! Snazzy snaps, outrageous outsides, wild wingovers and sustained inverted flight are all at your fingertips with this bird's semi-symmetrical airfoil.



Lightweight and durable, the Cessna is the kind of plane every modeler ought to have in the hangar.

That's because this is a model that's hard to beat when it's time to transition from a trainer. A model that's great for club events and no-fuss flying sessions whatever your flying skills may be.

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SPECIFICATIONS
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Weight: 5½–6 lbs.
Channels: 4
Engines: .40–.46 two-stroke
.45–.60 four-stroke

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MASTER SCALE & BEYOND

NESTLED DEEP within the catacomb-like basement of an aging building at North Carolina State University is a small room known as the Aviation Research Lab where aerospace engineering students apply their theory. The magnitude of their accomplishments is hard to believe until you witness not only their dedication, but also their truly awesome 17.5 percent scale F/A-18E. This is a five-year project funded by the Navy to gather data for the Naval Aircraft Warfare Center as they develop a major upgrade of the original F/A-18C. The new full-scale aircraft is actually 25 percent larger and incorporates some major aerodynamic and intake changes.



The flying model represents the culmination of a two-year effort to design and build the plane, which spans 7.6 feet and is 10 feet in length. Powered by two SWB-3 turbine engines producing in excess of 35 pounds of thrust apiece, the 140-pound jet flies for 6 to 8 minutes after takeoff while gathering inflight data through its onboard computers for analysis. Robert Vess, a professor and lecturer at NC State, does the actual flying while someone else holds a back-up transmitter in case of a failure.



Two SWB-3 jets power the plane. Cylinder in the center is air cylinder (1,500psi) for the retracts and brakes.

The initial flight tests are not utilizing the full array of avionics that will eventually be able to transmit video to a ground-based simulated cockpit where a pilot will be able to control the plane once it is in the air. After the remote cockpit pilot has finished his flight maneuvers, control will be given back to Robert, and he'll land the plane. During the recent shake-down flights I witnessed, the leading-edge extenders were locked in a 15-degree position with the gear extended and some degree of flaps employed. Each data flight is carefully orchestrated to obtain specific information in accordance with the Navy's data-acquisition program. The data gathered during these flights is far more accurate than wind-tunnel data because it is gathered during the actual maneuver rather than during a fixed, single-axis test.

The modeling world is well-represented in this project, as Robert received information from Bob Violett, and much of the mold and lay-up work was done by Jeff Foley. JR* radios are used throughout and have performed flawlessly. Because of the complexity of the scale requirements and the dynamics involved with such a plane, many of the normally available retract components were not suitable, so the engineering students had to either adapt or completely redesign them. The pneumatic system operates from a specially designed, small, stainless-steel tank holding 1,500psi and regulated down to the 120 used throughout the system. The charging is done from a scuba tank prior to each flight, and a custom sequencing valve and positive locks are used to actuate and lock the gear and doors in place.



Robert Vess's team preps the F18 for flight.

The building techniques employed throughout the airframe are indicative of homebuilt aircraft. The wings are a combination of blue and pink foam with Kevlar cloth and carbon fiber that will accommodate a force of 12G. Control-surface servos are highly modified JR super servos using worm gears and an external pot. In case of emergency, an onboard ballistic parachute allows the disabled aircraft to settle safely to Earth much like many ultralight aircraft.

Spending a couple of days watching the students work on the airplane and program the computers for specific data gathering, I felt I was looking into the future. I was struck by the amount of data they can gather about actual flight conditions without ever endangering a test pilot or the national budget. As a retired Army aviator, I got a sense that our aviation future is in good hands, and we've taken an approach that is not only safer, but also more fiscally sound. The accuracy and amount of data collected on each flight far exceeds what was previously possible through the more commonplace drop and drone tests. This was certainly not a sport plane I was watching, and many of the accomplishments of this group of people are way beyond the realm of the "normal" modeler, but one thing stood out: our hobby can truly contribute to the future of aviation research. Further information can be found on their website: www.mae.ncsu.edu/-aero/F18/.

—Greg Gimlick

**Addresses are listed alphabetically in the Index of Manufacturers on page 124.*